

California High-Speed Train Project



Agreement No.: HSR 13-06
Book 3, Part E, Subpart 2

Preliminary Ground Motion Data

HSR 13-06 - EXECUTION VERSION

Revision No.	Date	Description
0	01 Mar 12	Initial Release, R0
1	02 Oct 12	Addendum 5
2	31 Jul 13	EXECUTION VERSION

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GROUND MOTION DESCRIPTION

GROUND MOTION ZONE MAP

DESIGN SPECTRA ZONES 1 TO 7 – OBE & MCE

TIME HISTORY ZONES 1 TO 7 – OBE ⁽¹⁾

TIME HISTORY ZONES 1 TO 7 – MCE ⁽¹⁾

⁽¹⁾ Data points not plotted, see Attachments for data point files.

HSR 13-06 - EXECUTION VERSION

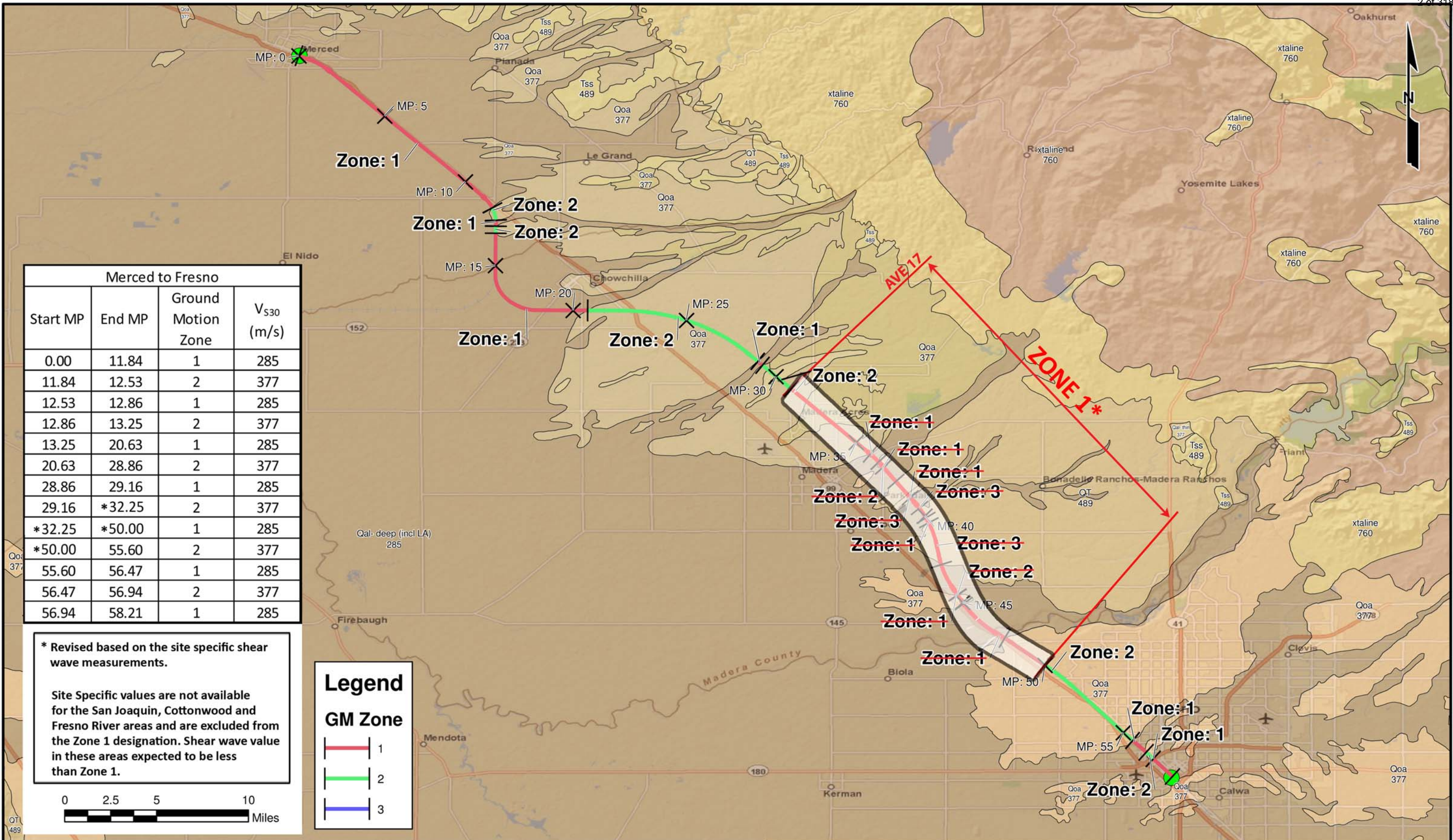


GROUND MOTIONS FOR PRELIMINARY DESIGN OF CALIFORNIA HIGH SPEED RAIL PROJECT

Ground motions are provided for all seven zones in the Merced to Bakersfield segments of the California High Speed Train Project. The Ground Motion Zone Map defines the limits of these zones. This section includes digital formats of the ground motions, developed for preliminary design at Operating Basis Earthquake (OBE) and Maximum Considered Earthquake (MCE) seismic hazard levels, and the documented plots for these motions.

Included are the design spectra and seven digitally formatted files of developed ground motions for the OBE and MCE seismic design events, respectively. Each file includes seven sets of spectrally-matched motions (SMMs). Each SMM set, denoted by a Next Generation Attenuation (NGA) Models number (e.g., NGA_no_1208) leading the filename, includes three files representing for three components in Horizontal 1 (H1-), Horizontal 2 (H2-), and Vertical (V-) directions, respectively. Each of these three files includes the number of data points, time interval, two dummy numbers, and the digital formats for acceleration (denoted by *acceI* in units of g), velocity (denoted by *vel* in units of cm/s), and displacement (denoted by *displ* in units of cm) history.

The Word files for documented plots, ground motion metrics for selected seed motions and SMMs are first listed in a table. These metrics are earthquake name, year of the earthquake event, station name, moment magnitude (Mw), and distance (R) for each selected seed motion, and peak ground acceleration (PGA), peak ground velocity (PGV), peak ground displacement (PGD) in H1-, H2-, and V-directions, respectively, for each SMM. This is followed by 21 plates, each of which presents plots of time histories and SMM spectrum plotted against design spectrum for one component of the developed ground motions. The NGA number appeared in the filename of digital formats also services as a reference (appeared as NGA#) to the documented plots of the developed ground motions. In each plate, plots in the left show the time histories of acceleration (A), velocity (V), and displacement (D) of SMM. A signed peak value is shown at the right of each time history plot. Positive peak value for A, V, or D is located above the baseline of the time history, while negative peak value is shown below the baseline. In the right plot of each plate, the computed SMM spectrum is plotted against the target spectrum.



Merced to Fresno			
Start MP	End MP	Ground Motion Zone	V _{s30} (m/s)
0.00	11.84	1	285
11.84	12.53	2	377
12.53	12.86	1	285
12.86	13.25	2	377
13.25	20.63	1	285
20.63	28.86	2	377
28.86	29.16	1	285
29.16	*32.25	2	377
*32.25	*50.00	1	285
*50.00	55.60	2	377
55.60	56.47	1	285
56.47	56.94	2	377
56.94	58.21	1	285

* Revised based on the site specific shear wave measurements.

Site Specific values are not available for the San Joaquin, Cottonwood and Fresno River areas and are excluded from the Zone 1 designation. Shear wave value in these areas expected to be less than Zone 1.

0 2.5 5 10 Miles

Legend

GM Zone

1

2

3

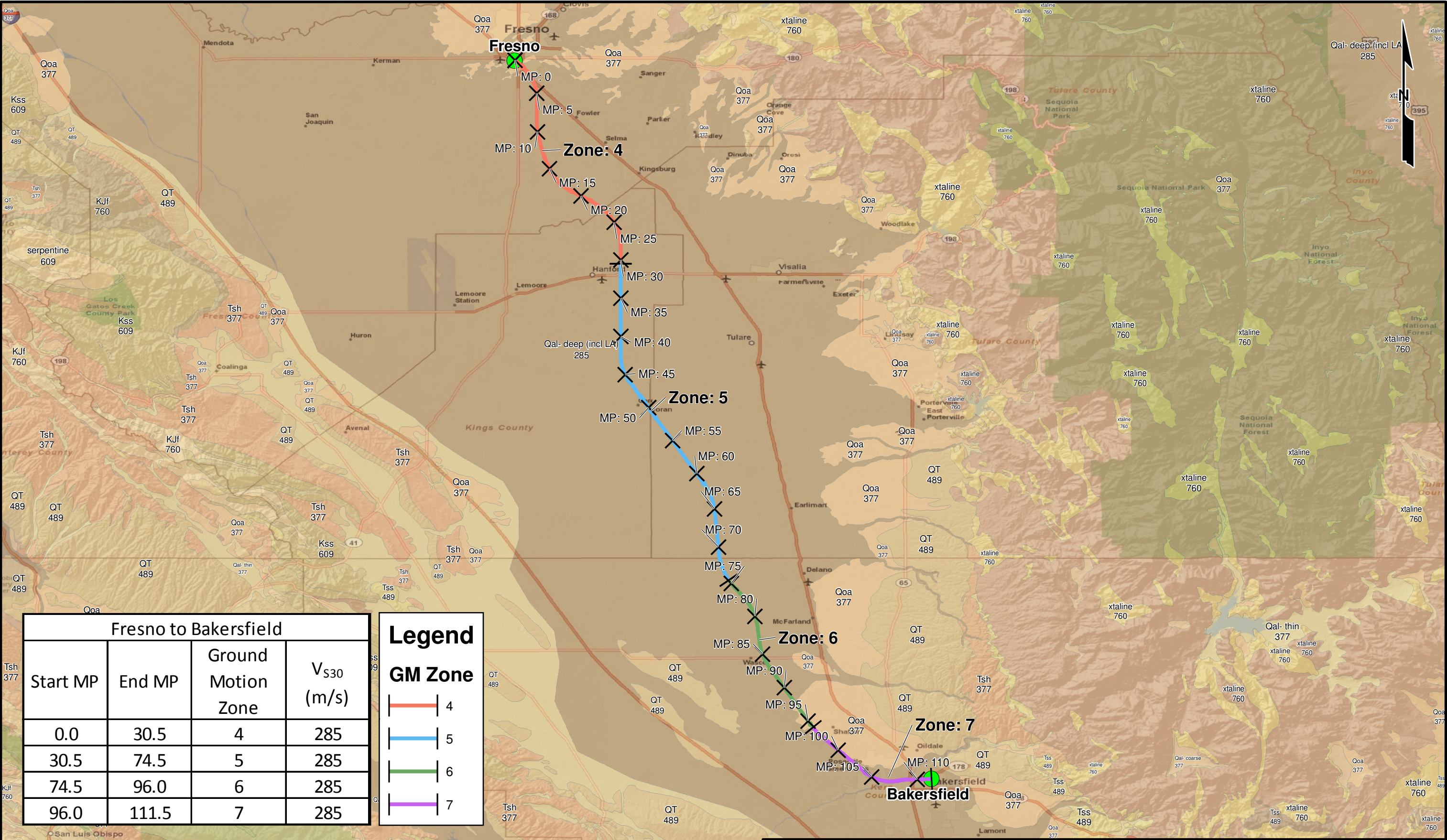
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DRAWN BY:	I.McGovern
CHECKED BY:	Z.Zafir
FILE NAME:	VS30 M-Fre.MXD

GROUND MOTION ZONE MAP MERCED TO FRESNO	
CALIFORNIA HIGH SPEED TRAIN PROJECT 30% DESIGN GROUND MOTIONS	

PLATE
3-4

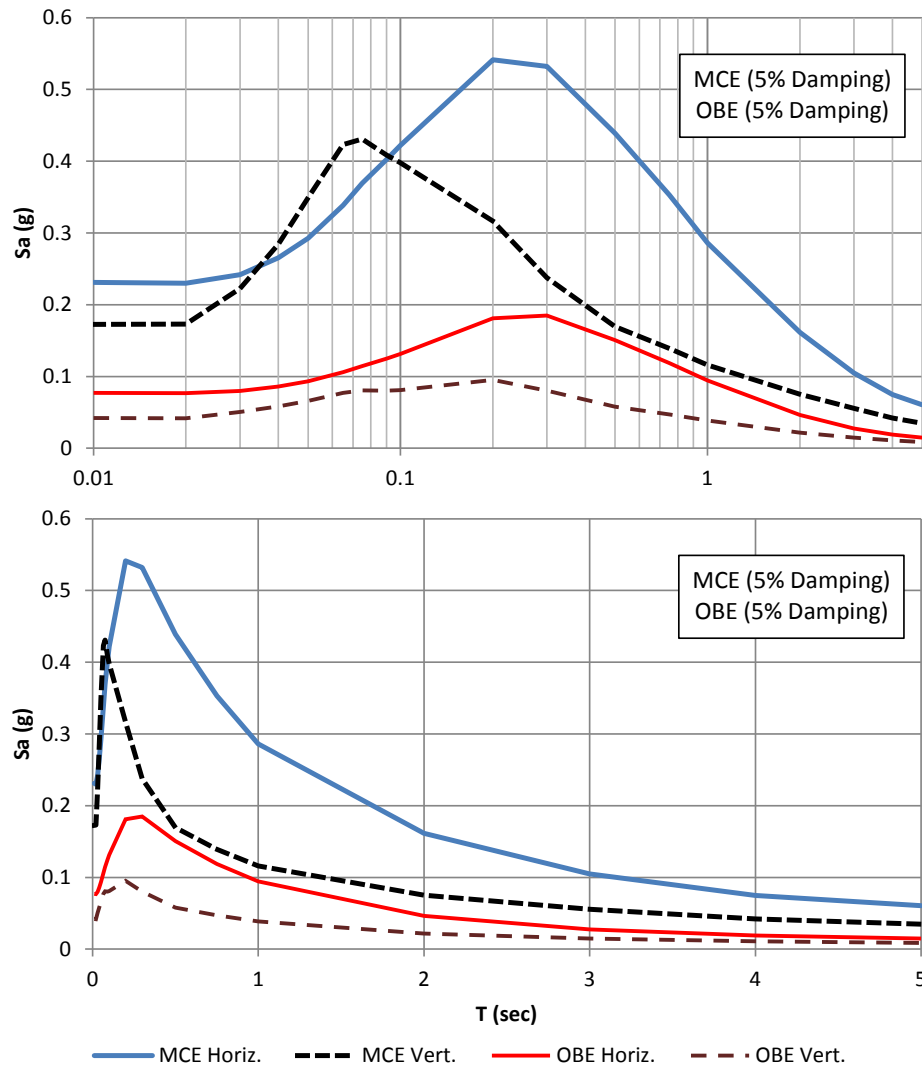




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PROJECT NO.	112153	GROUND MOTION ZONE MAP FRESNO TO BAKERSFIELD	PLATE 3-5
DRAWN:	6/24/11		
DRAWN BY:	I.McGovern		
CHECKED BY:	Z.Zafir	CALIFORNIA HIGH SPEED TRAIN PROJECT 30% DESIGN GROUND MOTIONS	
FILE NAME:	VS30 F-B.MXD		

Merced-Fresno Segment, Zone 1



Period, T (sec)	Spectral Acceleration, Sa (g)				Period, T (sec)	Spectral Acceleration, Sa (g)			
	MCE (5%, 950 Years)		OBE (5%, 50 Years)			MCE (5%, 950 Years)		OBE (5%, 50 Years)	
	Horizontal	Vertical	Horizontal	Vertical		Horizontal	Vertical	Horizontal	Vertical
0.01	0.2309	0.1727	0.0771	0.0419	0.2	0.5413	0.3164	0.1809	0.0951
0.02	0.2300	0.1730	0.0767	0.0417	0.3	0.5319	0.2376	0.1848	0.0800
0.03	0.2417	0.2227	0.0799	0.0504	0.5	0.4389	0.1694	0.1508	0.0580
0.04	0.2654	0.2843	0.0861	0.0581	0.75	0.3531	0.1391	0.1185	0.0469
0.05	0.2925	0.3491	0.0933	0.0659	1	0.2863	0.1161	0.0943	0.0385
0.065	0.3386	0.4231	0.1059	0.0770	2	0.1615	0.0750	0.0462	0.0218
0.075	0.3693	0.4308	0.1145	0.0806	3	0.1050	0.0556	0.0275	0.0148
0.09	0.4024	0.4087	0.1247	0.0803	4	0.0749	0.0422	0.0190	0.0109
0.1	0.4220	0.3977	0.1313	0.0808	5	0.0606	0.0346	0.0147	0.0085

SC
SOLUTIONS

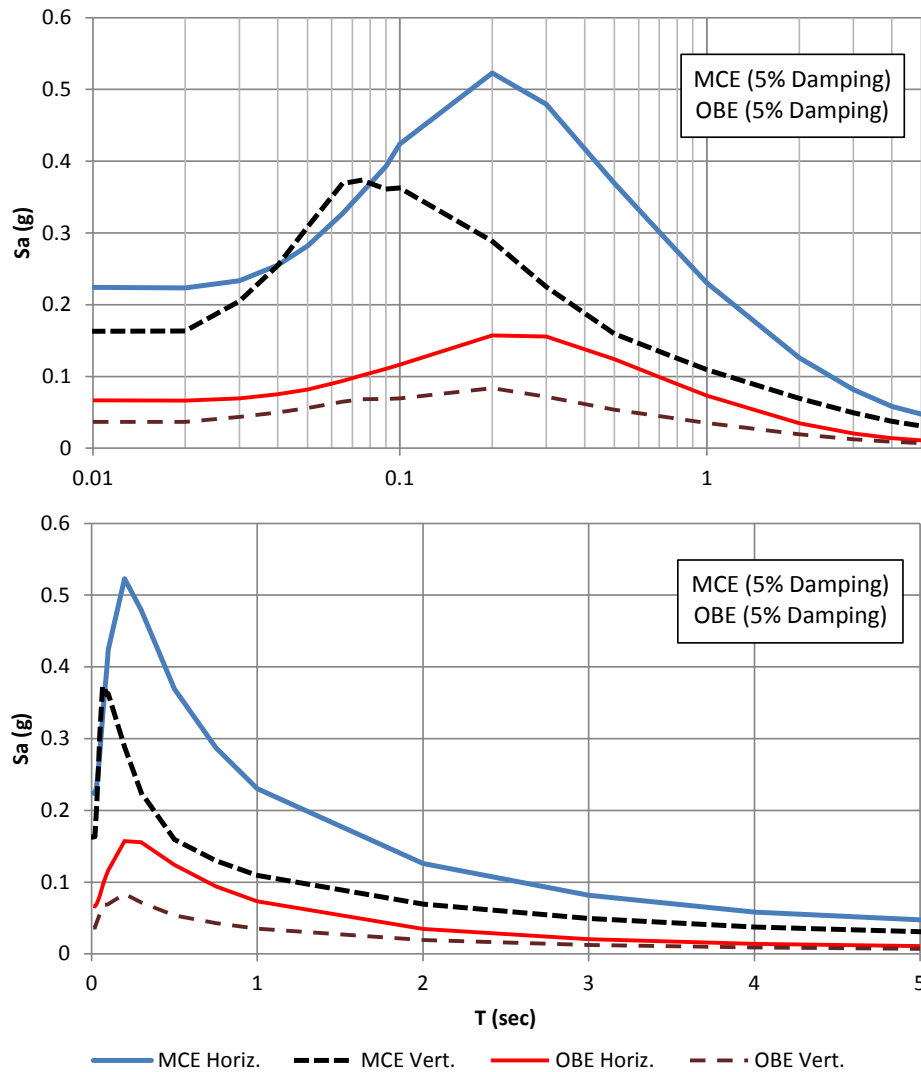
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M. Perez
M. Tabatabaie
02/27/2012

PLATE C-1. ZONE 1 DESIGN SPECTRA: OBE AND MCE

CALIFORNIA HIGH SPEED TRAIN PROJECT
MERCED TO BAKERSFIELD, CALIFORNIA

Merced-Fresno Segment, Zone 2



Period, T (sec)	Spectral Acceleration, Sa (g)				Period, T (sec)	Spectral Acceleration, Sa (g)			
	MCE (5%, 950 Years)		OBE (5%, 50 Years)			MCE (5%, 950 Years)		OBE (5%, 50 Years)	
	Horizontal	Vertical	Horizontal	Vertical		Horizontal	Vertical	Horizontal	Vertical
0.01	0.2241	0.1631	0.0669	0.0367	0.2	0.5230	0.2884	0.1572	0.0836
0.02	0.2234	0.1632	0.0665	0.0366	0.3	0.4792	0.2248	0.1556	0.0719
0.03	0.2333	0.2048	0.0695	0.0436	0.5	0.3694	0.1596	0.1239	0.0537
0.04	0.2548	0.2546	0.0753	0.0496	0.75	0.2874	0.1300	0.0939	0.0429
0.05	0.2817	0.3085	0.0819	0.0558	1	0.2304	0.1094	0.0731	0.0351
0.065	0.3268	0.3688	0.0935	0.0648	2	0.1261	0.0693	0.0348	0.0194
0.075	0.3558	0.3734	0.1014	0.0681	3	0.0818	0.0494	0.0204	0.0125
0.09	0.3929	0.3610	0.1105	0.0686	4	0.0582	0.0374	0.0140	0.0091
0.1	0.4239	0.3628	0.1163	0.0695	5	0.0473	0.0308	0.0108	0.0071

SC
SOLUTIONS

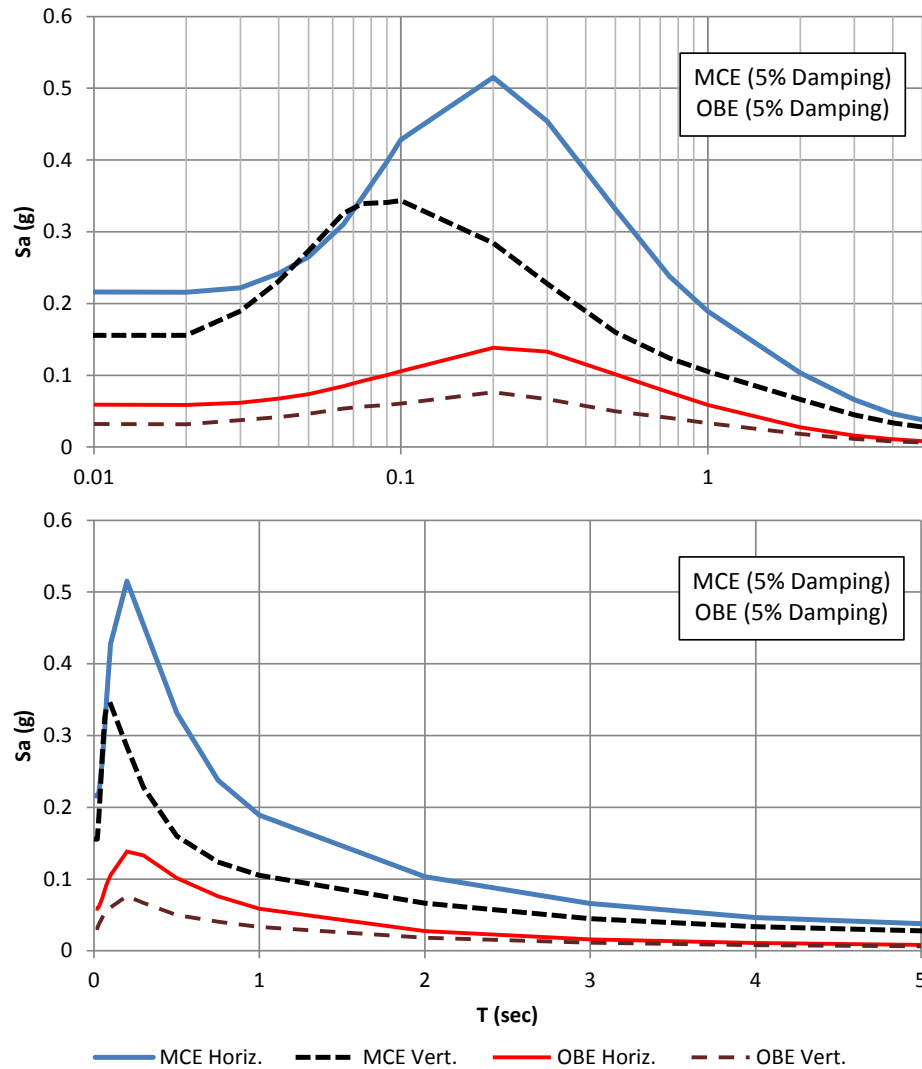
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PLATE C-2. ZONE 2 DESIGN SPECTRA: OBE AND MCE

CALIFORNIA HIGH SPEED TRAIN PROJECT
MERCED TO BAKERSFIELD, CALIFORNIA

Merced-Fresno Segment, Zone 3



Period, T (sec)	Spectral Acceleration, Sa (g)				Period, T (sec)	Spectral Acceleration, Sa (g)			
	MCE (5%, 950 Years)		OBE (5%, 50 Years)			MCE (5%, 950 Years)		OBE (5%, 50 Years)	
	Horizontal	Vertical	Horizontal	Vertical		Horizontal	Vertical	Horizontal	Vertical
0.01	0.2160	0.1558	0.0592	0.0319	0.2	0.5150	0.2842	0.1385	0.0764
0.02	0.2155	0.1558	0.0588	0.0317	0.3	0.4541	0.2275	0.1331	0.0667
0.03	0.2219	0.1896	0.0617	0.0373	0.5	0.3316	0.1597	0.1014	0.0499
0.04	0.2419	0.2311	0.0673	0.0418	0.75	0.2375	0.1235	0.0758	0.0404
0.05	0.2650	0.2736	0.0737	0.0464	1	0.1892	0.1051	0.0586	0.0334
0.065	0.3103	0.3259	0.0847	0.0536	2	0.1031	0.0662	0.0275	0.0181
0.075	0.3484	0.3393	0.0921	0.0565	3	0.0659	0.0448	0.0159	0.0111
0.09	0.3973	0.3408	0.1003	0.0586	4	0.0463	0.0335	0.0108	0.0080
0.1	0.4283	0.3436	0.1055	0.0607	5	0.0379	0.0278	0.0084	0.0063

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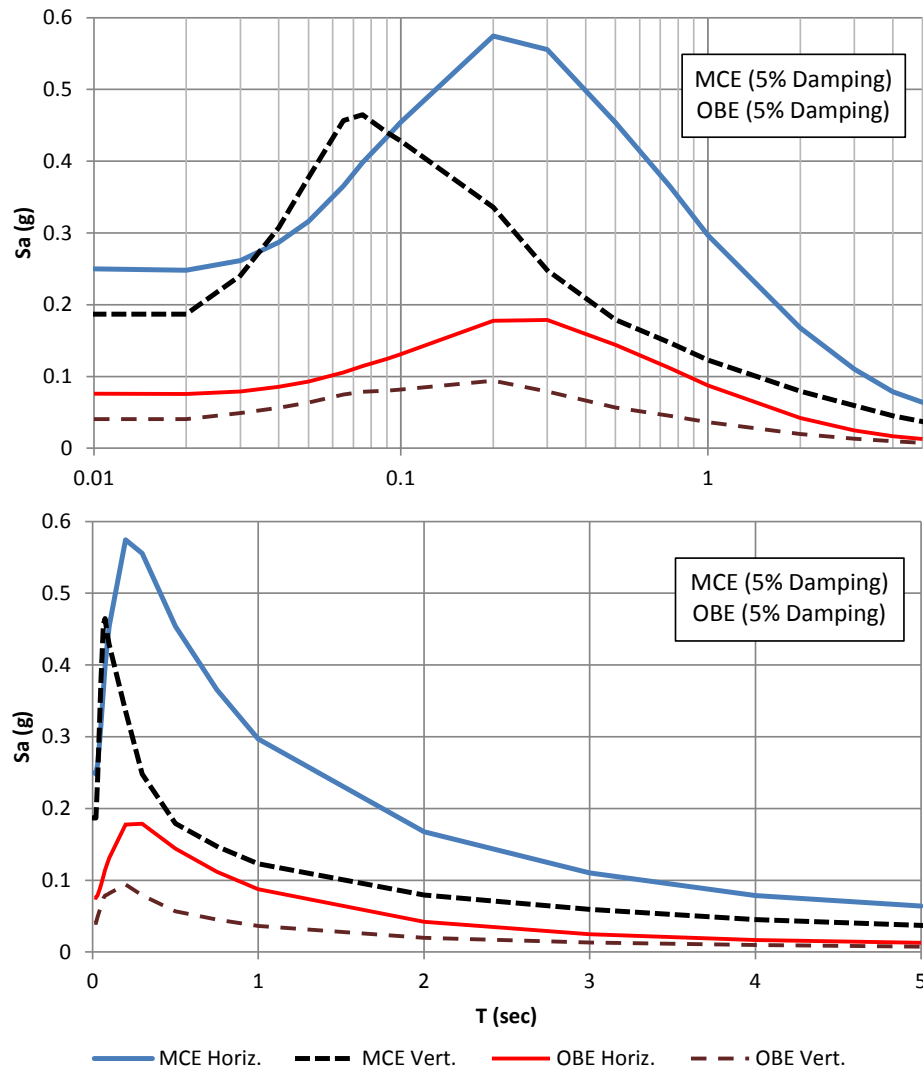
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**PLATE C-3. ZONE 3 DESIGN SPECTRA:
OBE AND MCE**

CALIFORNIA HIGH SPEED TRAIN PROJECT
MERCED TO BAKERSFIELD, CALIFORNIA

Fresno-Bakersfield Segment, Zone 4



Period, T (sec)	Spectral Acceleration, Sa (g)				Period, T (sec)	Spectral Acceleration, Sa (g)			
	MCE (5%, 950 Years)		OBE (5%, 50 Years)			MCE (5%, 950 Years)		OBE (5%, 50 Years)	
	Horizontal	Vertical	Horizontal	Vertical		Horizontal	Vertical	Horizontal	Vertical
0.01	0.2498	0.1868	0.0761	0.0407	0.2	0.5745	0.3358	0.1775	0.0941
0.02	0.2482	0.1867	0.0757	0.0405	0.3	0.5556	0.2482	0.1789	0.0792
0.03	0.2613	0.2408	0.0790	0.0489	0.5	0.4538	0.1790	0.1441	0.0569
0.04	0.2870	0.3074	0.0854	0.0563	0.75	0.3654	0.1471	0.1117	0.0450
0.05	0.3160	0.3772	0.0927	0.0638	1	0.2969	0.1230	0.0875	0.0363
0.065	0.3655	0.4567	0.1056	0.0747	2	0.1677	0.0795	0.0421	0.0199
0.075	0.3982	0.4646	0.1143	0.0785	3	0.1101	0.0595	0.0247	0.0134
0.09	0.4334	0.4402	0.1244	0.0801	4	0.0787	0.0452	0.0168	0.0097
0.1	0.4542	0.4280	0.1310	0.0819	5	0.0639	0.0372	0.0130	0.0076

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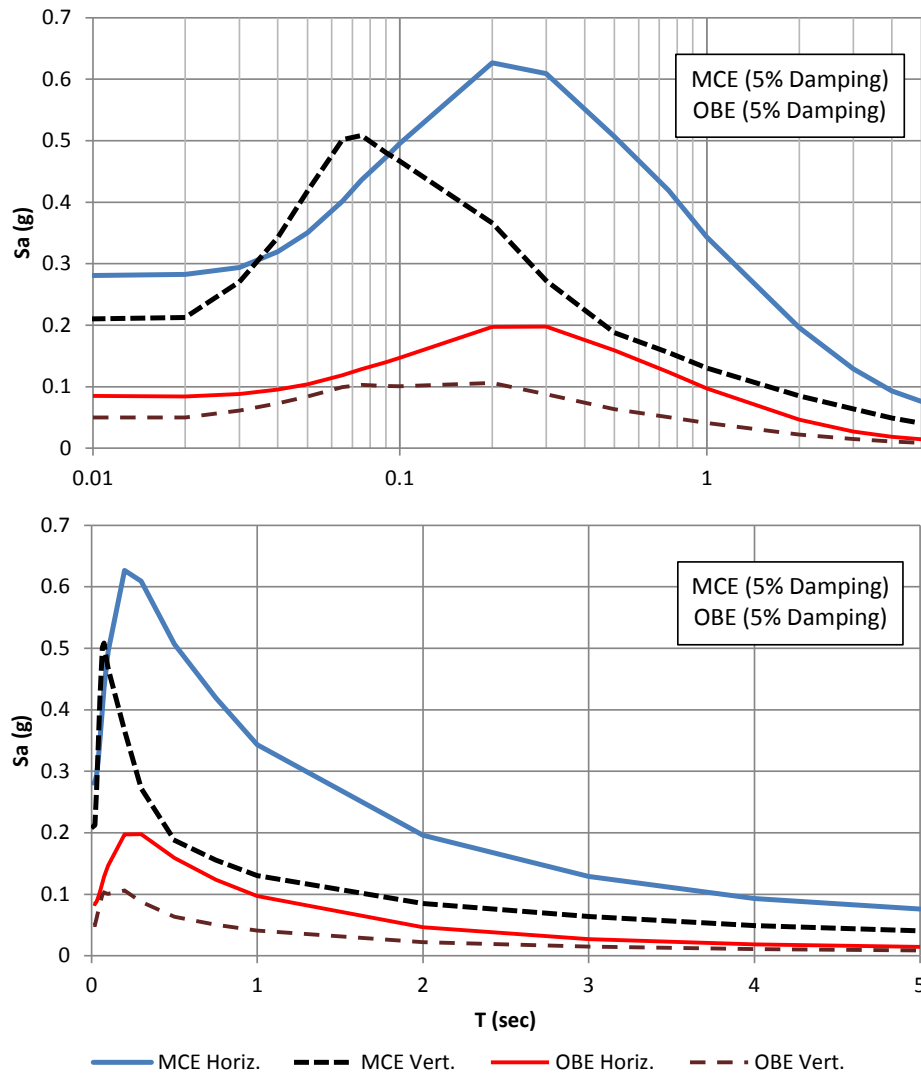
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M. Tabatabaie
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**PLATE C-4. ZONE 4 DESIGN SPECTRA:
OBE AND MCE**

CALIFORNIA HIGH SPEED TRAIN PROJECT
MERCED TO BAKERSFIELD, CALIFORNIA

HSR 13-06 - EXECUTION VERSION

Fresno-Bakersfield Segment, Zone 5



Period, T (sec)	Spectral Acceleration, Sa (g)				Period, T (sec)	Spectral Acceleration, Sa (g)			
	MCE (5%, 950 Years)		OBE (5%, 50 Years)			MCE (5%, 950 Years)		OBE (5%, 50 Years)	
	Horizontal	Vertical	Horizontal	Vertical		Horizontal	Vertical	Horizontal	Vertical
0.01	0.2810	0.2102	0.0848	0.0500	0.2	0.6267	0.3663	0.1972	0.1061
0.02	0.2824	0.2124	0.0841	0.0498	0.3	0.6091	0.2721	0.1976	0.0875
0.03	0.2937	0.2705	0.0881	0.0614	0.5	0.5067	0.1880	0.1590	0.0633
0.04	0.3195	0.3422	0.0955	0.0727	0.75	0.4190	0.1554	0.1236	0.0504
0.05	0.3505	0.4183	0.1039	0.0843	1	0.3431	0.1305	0.0973	0.0409
0.065	0.4017	0.5019	0.1186	0.0994	2	0.1959	0.0850	0.0463	0.0223
0.075	0.4360	0.5087	0.1286	0.1032	3	0.1290	0.0639	0.0273	0.0150
0.09	0.4731	0.4805	0.1399	0.1012	4	0.0929	0.0489	0.0186	0.0109
0.1	0.4953	0.4667	0.1472	0.1008	5	0.0762	0.0407	0.0145	0.0086

SC
SOLUTIONS

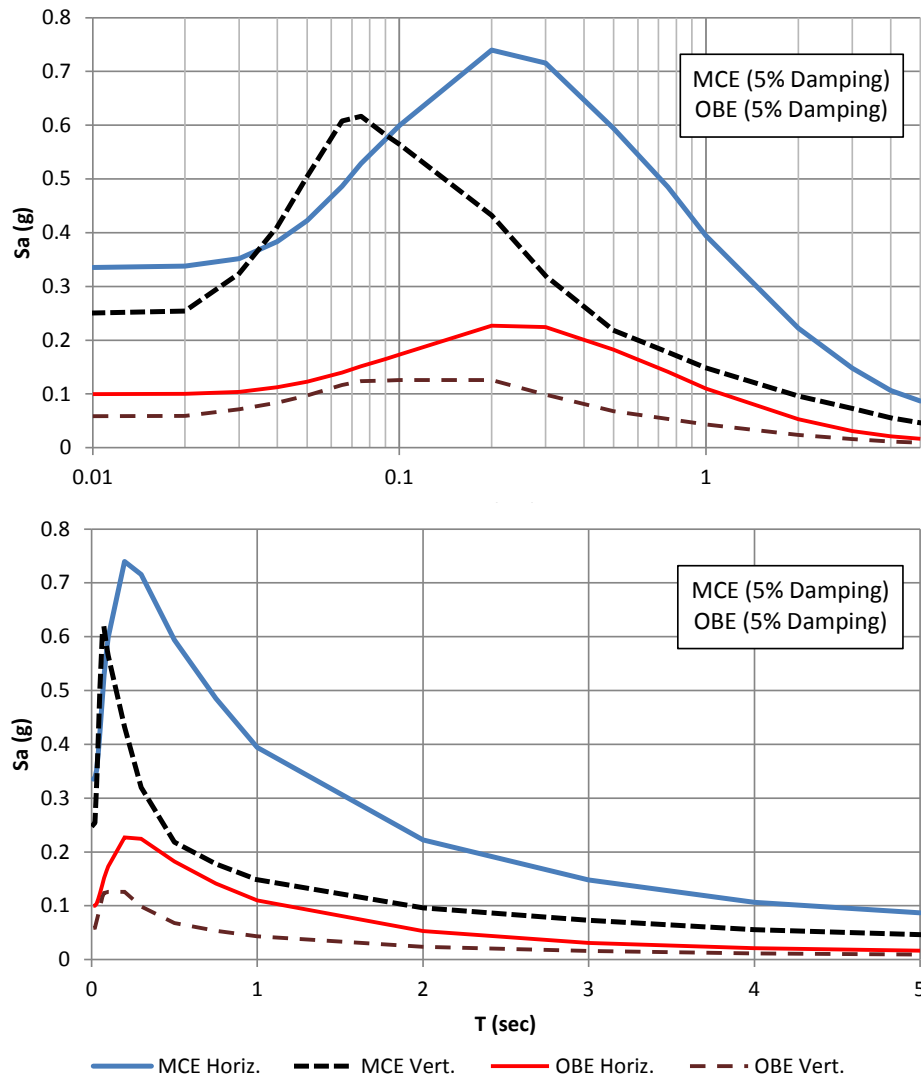
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**PLATE C-5. ZONE 5 DESIGN SPECTRA:
OBE AND MCE**

CALIFORNIA HIGH SPEED TRAIN PROJECT
MERCED TO BAKERSFIELD, CALIFORNIA

Fresno-Bakersfield Segment, Zone 6



Period, T (sec)	Spectral Acceleration, Sa (g)				Period, T (sec)	Spectral Acceleration, Sa (g)			
	MCE (5%, 950 Years)		OBE (5%, 50 Years)			MCE (5%, 950 Years)		OBE (5%, 50 Years)	
	Horizontal	Vertical	Horizontal	Vertical		Horizontal	Vertical	Horizontal	Vertical
0.01	0.3354	0.2508	0.0999	0.0587	0.2	0.7398	0.4324	0.2272	0.1259
0.02	0.3379	0.2541	0.1001	0.0590	0.3	0.7158	0.3198	0.2247	0.0987
0.03	0.3515	0.3238	0.1040	0.0717	0.5	0.5940	0.2185	0.1824	0.0678
0.04	0.3837	0.4111	0.1126	0.0838	0.75	0.4852	0.1775	0.1414	0.0536
0.05	0.4227	0.5045	0.1227	0.0974	1	0.3942	0.1485	0.1101	0.0431
0.065	0.4863	0.6076	0.1399	0.1168	2	0.2226	0.0960	0.0530	0.0239
0.075	0.5286	0.6167	0.1516	0.1240	3	0.1479	0.0728	0.0311	0.0160
0.09	0.5733	0.5823	0.1647	0.1250	4	0.1064	0.0557	0.0214	0.0117
0.1	0.5991	0.5646	0.1730	0.1257	5	0.0870	0.0462	0.0166	0.0092

SC
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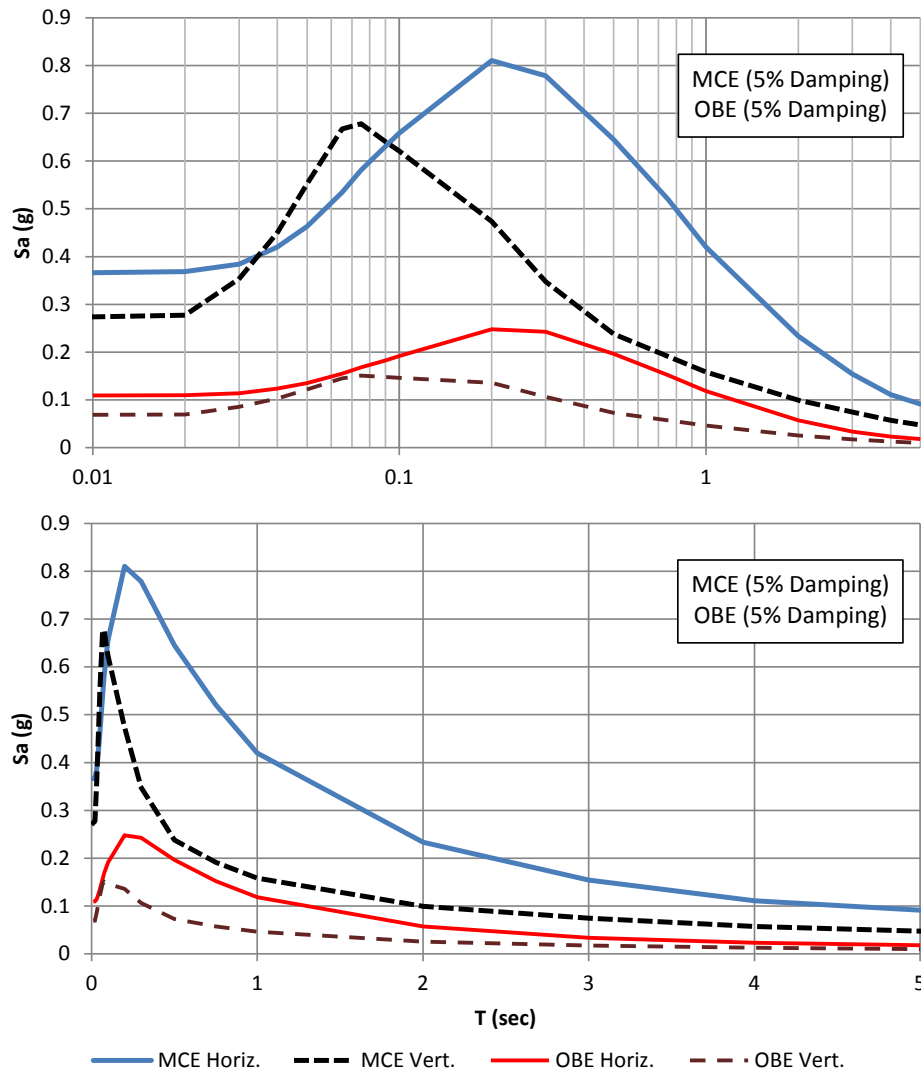
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PLATE C-6. ZONE 6 DESIGN SPECTRA: OBE AND MCE

CALIFORNIA HIGH SPEED TRAIN PROJECT
MERCED TO BAKERSFIELD, CALIFORNIA

Fresno-Bakersfield Segment, Zone 7



Period, T (sec)	Spectral Acceleration, Sa (g)				Period, T (sec)	Spectral Acceleration, Sa (g)			
	MCE (5%, 950 Years)		OBE (5%, 50 Years)			MCE (5%, 950 Years)		OBE (5%, 50 Years)	
	Horizontal	Vertical	Horizontal	Vertical		Horizontal	Vertical	Horizontal	Vertical
0.01	0.3662	0.2738	0.1094	0.0688	0.2	0.8105	0.4737	0.2478	0.1361
0.02	0.3685	0.2771	0.1097	0.0693	0.3	0.7786	0.3478	0.2426	0.1062
0.03	0.3840	0.3538	0.1141	0.0856	0.5	0.6451	0.2382	0.1967	0.0727
0.04	0.4201	0.4500	0.1238	0.1029	0.75	0.5202	0.1914	0.1519	0.0572
0.05	0.4633	0.5530	0.1355	0.1218	1	0.4198	0.1582	0.1184	0.0461
0.065	0.5341	0.6673	0.1549	0.1454	2	0.2334	0.0994	0.0571	0.0256
0.075	0.5810	0.6779	0.1681	0.1511	3	0.1543	0.0748	0.0338	0.0173
0.09	0.6304	0.6403	0.1826	0.1478	4	0.1110	0.0572	0.0233	0.0127
0.1	0.6586	0.6207	0.1916	0.1464	5	0.0912	0.0477	0.0182	0.0100

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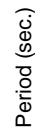
PLATE C-7. ZONE 7 DESIGN SPECTRA: OBE AND MCE

CALIFORNIA HIGH SPEED TRAIN PROJECT
MERCED TO BAKERSFIELD, CALIFORNIA

Table A.1: Ground Motion Metrics for Selected Seed and Spectrally-Matched Motions for Zone 1

Set	NGA #	Selected Seed Motions				Spectrally-Matched Motions									
		Earthquake Name	Year	Station Name	Mw	R	PGA H1 (g)	PGV H1 (cm/s)	PGD H1 (cm)	PGA H2 (g)	PGV H2 (cm/s)	PGD H2 (cm)	PGA V (g)	PGV V (cm/s)	PGD V (cm)
1	882	Landers	1992	North Palm Springs	7.28	26.84	0.231	20.762	11.289	0.222	23.869	13.170	0.164	11.354	6.307
2	1776	Hector Mine	1999	Desert Hot Springs	7.13	56.4	0.236	25.426	17.998	0.227	28.408	17.269	0.168	13.405	8.757
3	2112	Denali, Alaska	2002	TAPS Pump Station #08	7.9	104.94	0.222	29.831	16.466	0.228	24.175	21.284	0.164	14.792	14.774
4	1637	Manjil, Iran	1990	Rudsar	7.37	64.47	0.227	24.308	9.021	0.230	23.755	9.804	0.175	10.465	7.521
5	169	Imperial Valley-06	1979	Delta	6.53	22.03	0.232	21.379	13.272	0.227	22.160	12.090	0.170	11.381	7.626
6	1208	Chi-Chi, Taiwan	1999	CHY046	7.62	24.11	0.219	24.571	14.849	0.227	26.437	17.952	0.159	15.620	12.730
7	1164	Kocaeli, Turkey	1999	Istanbul	7.51	51.95	0.236	28.093	50.646	0.224	37.374	32.336	0.168	22.109	30.710

<div>SC SOLUTIONS</div>	<div>PROJ. NO: BY: QC CHECK: QA CHECK: DATE:</div> <div>J. Zhong M. Perez V. Jacob 09/07/2012</div>	<div>SELECTED SEED AND SPECTRALLY-MATCHED MOTIONS MCE – ZONE 1</div>	<div>PLATE A1-0</div>
		<div>CALIFORNIA HIGH SPEED TRAIN PROJECT MERCED TO FRESNO, CALIFORNIA</div>	



PLATE

CALIFORNIA HIGH SPEED TRAIN PROJECT
MERCED TO FRESNO, CALIFORNIA

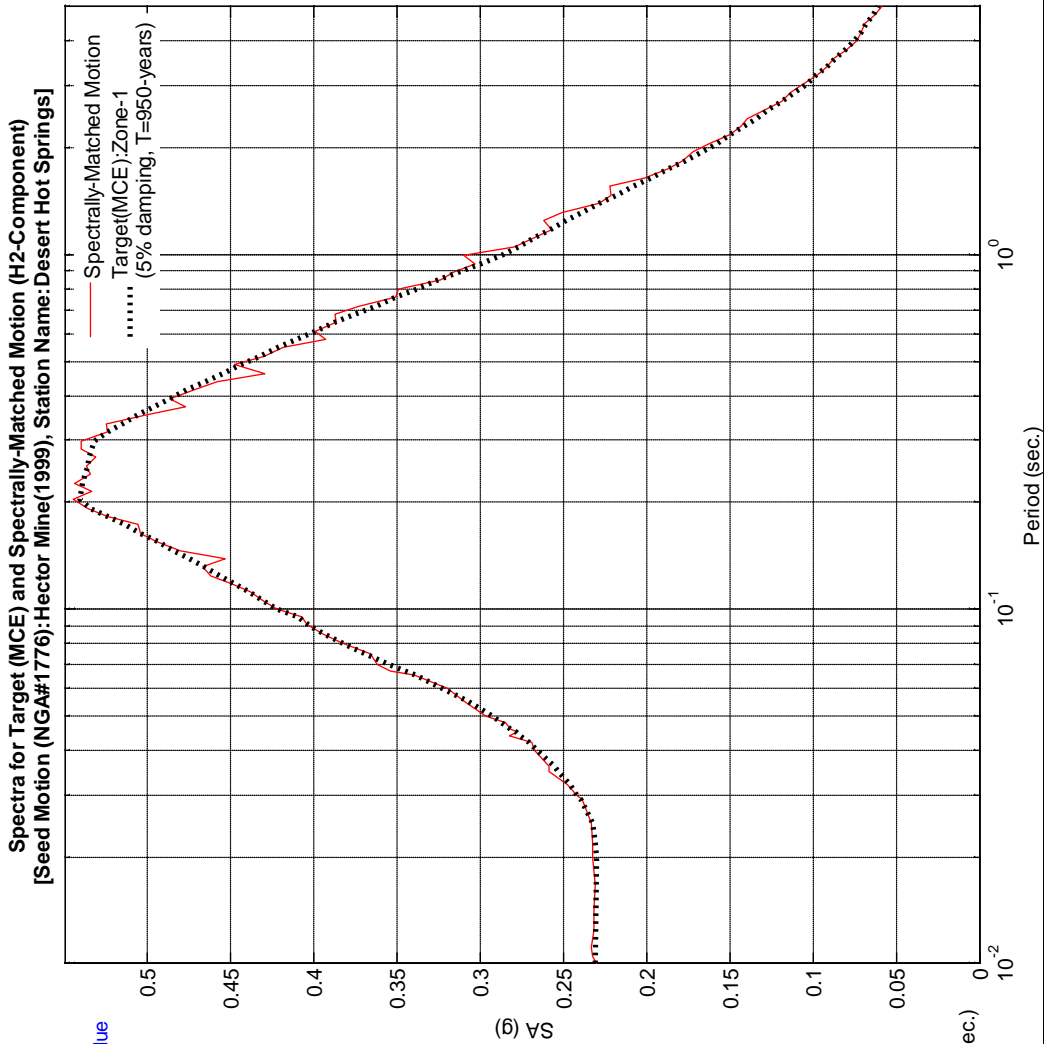
SC SOLUTIONS

A1-1



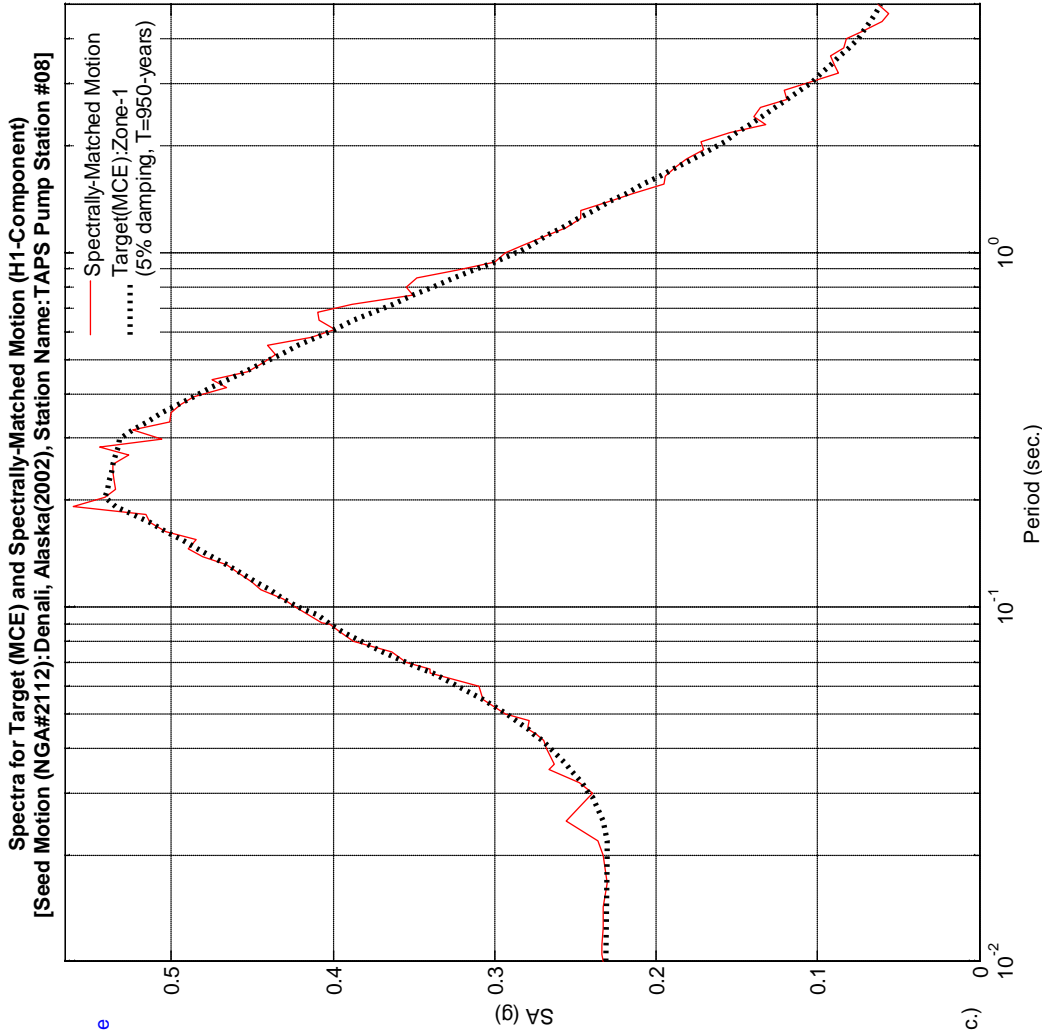




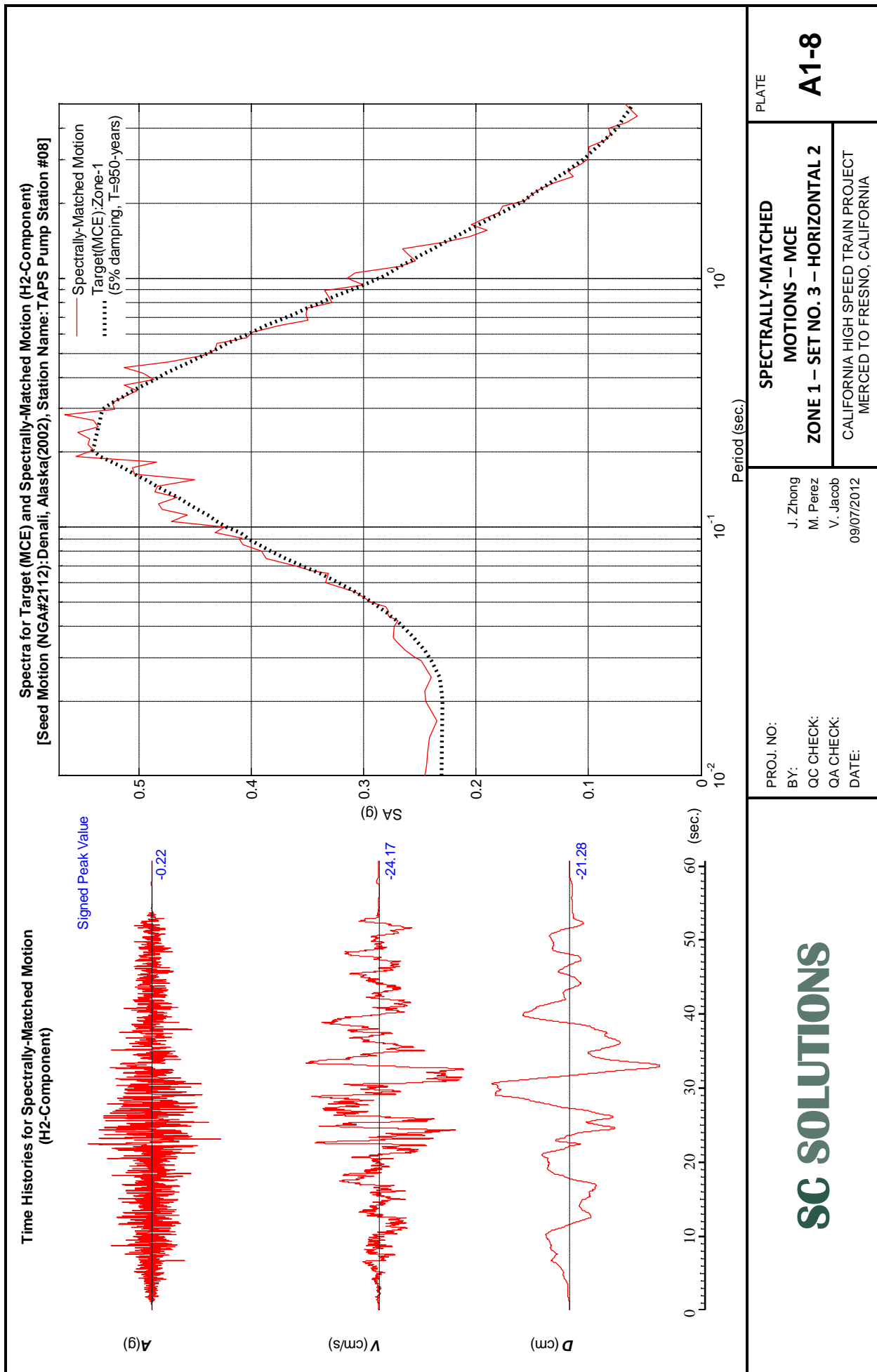


<div>SC SOLUTIONS</div>		PROJ. NO: BY: QC CHECK: QA CHECK: DATE:		J. Zhong M. Perez V. Jacob 09/07/2012		<div>SPECTRALLY-MATCHED MOTIONS – MCE ZONE 1 – SET NO. 2 – HORIZONTAL 2</div> <div>CALIFORNIA HIGH SPEED TRAIN PROJECT MERCED TO FRESNO, CALIFORNIA</div>		PLATE <div>A1-5</div>
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<div>SC SOLUTIONS</div>	<div>PROJ. NO: BY: QC CHECK: QA CHECK: DATE:</div>	<div>J. Zhong M. Perez V. Jacob 09/07/2012</div>	<div>SPECTRALLY-MATCHED MOTIONS – MCE ZONE 1 – SET NO. 3 – HORIZONTAL 1</div>	<div>PLATE A1-7</div>
			<div>CALIFORNIA HIGH SPEED TRAIN PROJECT MERCED TO FRESNO, CALIFORNIA</div>	





PLATE

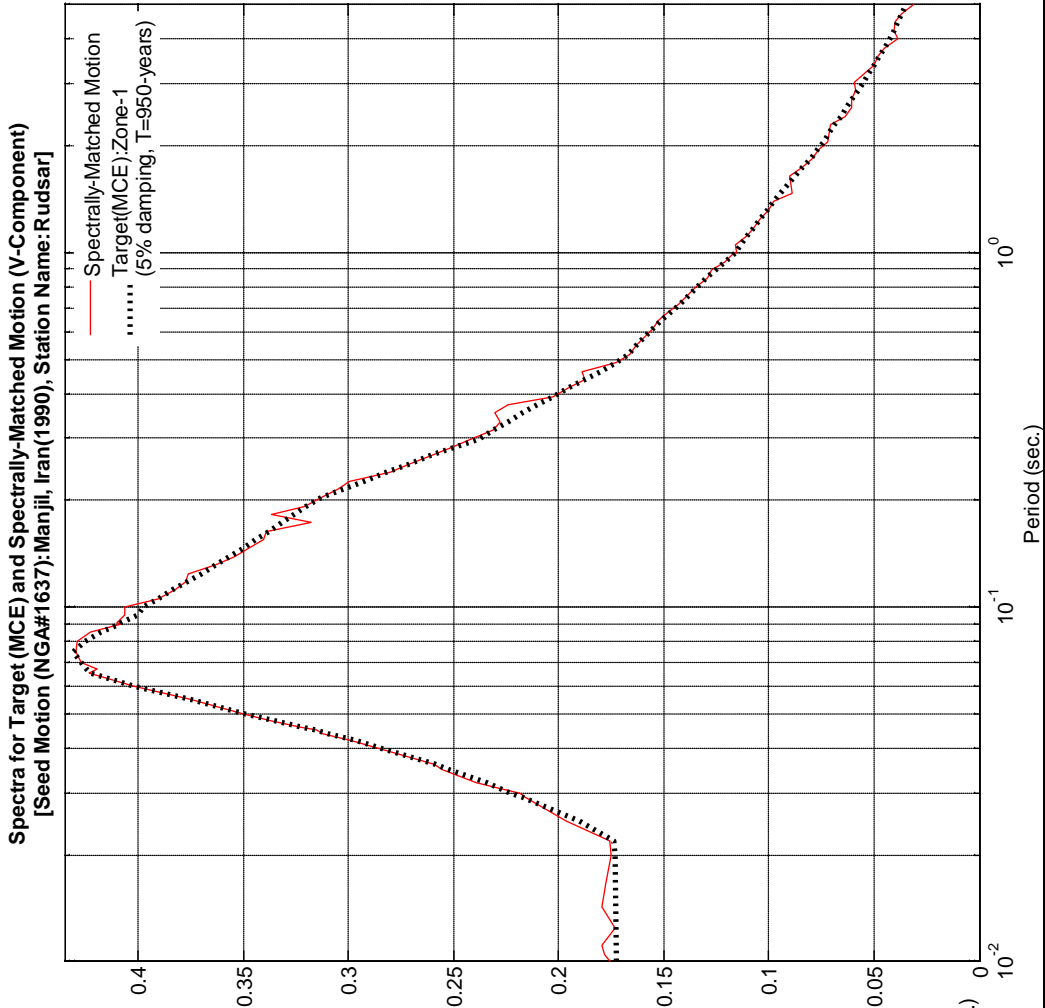
A1-9

CALIFORNIA HIGH SPEED TRAIN PROJECT
MERCED TO FRESNO, CALIFORNIA

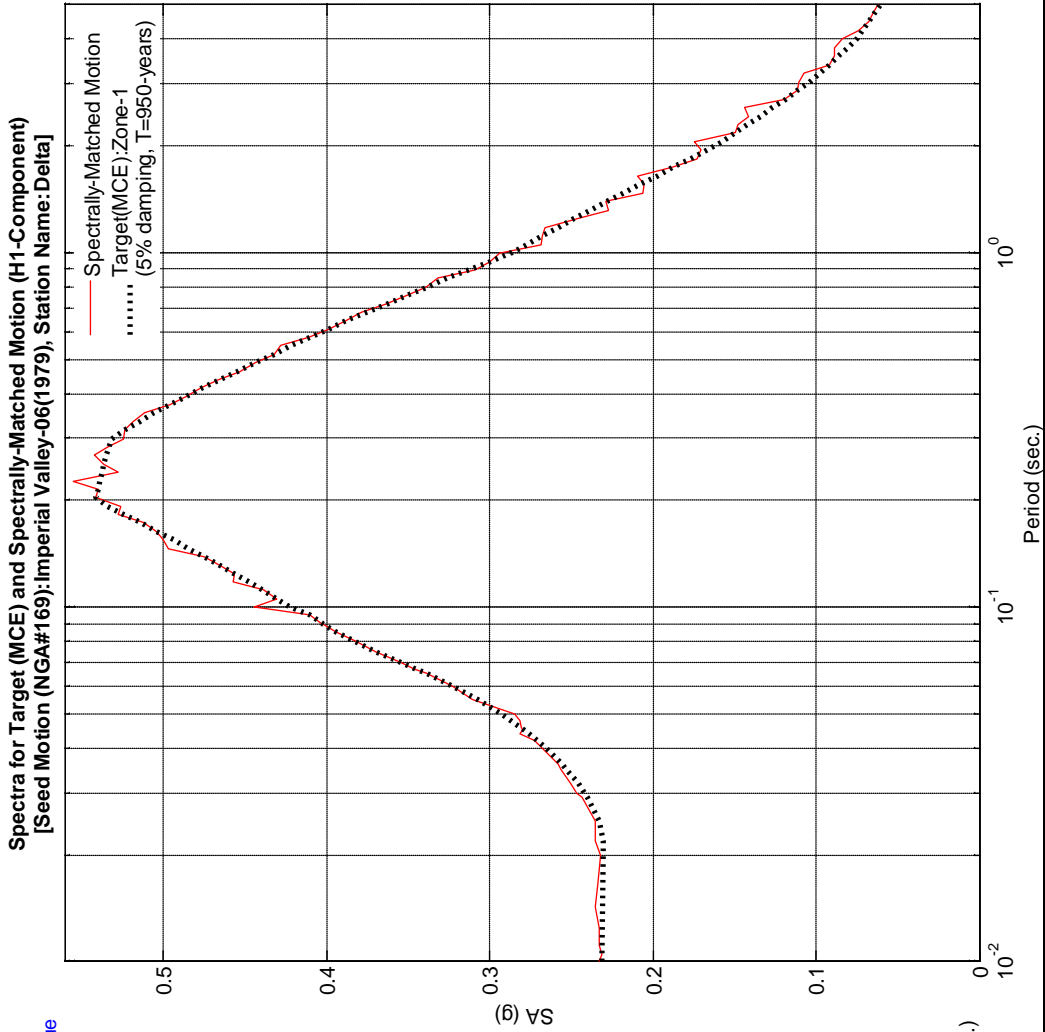
SC SOLUTIONS







<div>SC SOLUTIONS</div>	PROJ. NO:	J. Zhong M. Perez V. Jacob 09/07/2012	SPECTRALLY-MATCHED MOTIONS – MCE ZONE 1 – SET NO. 4 – VERTICAL		PLATE A1-12
	BY: QC CHECK: QA CHECK: DATE:		CALIFORNIA HIGH SPEED TRAIN PROJECT MERCED TO FRESNO, CALIFORNIA		



SC SOLUTIONS

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V. Jacob
09/07/2012

MOTIONS – MICE
ZONE 1 – SET NO. 5 – HORIZONTAL 1

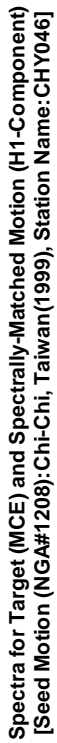
CALIFORNIA HIGH SPEED TRAIN PROJECT
MERCED TO FRESNO, CALIFORNIA

PLATE

A1-13

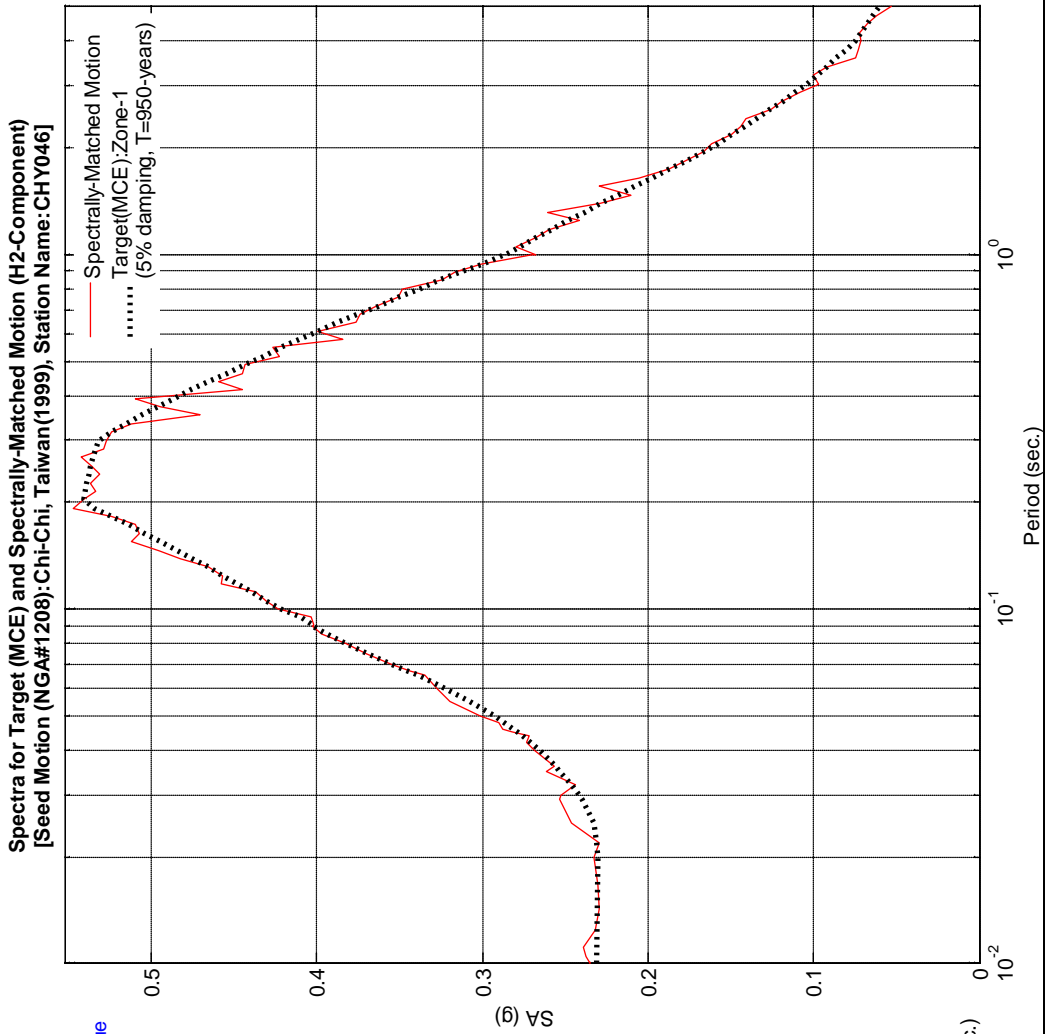






A1-16

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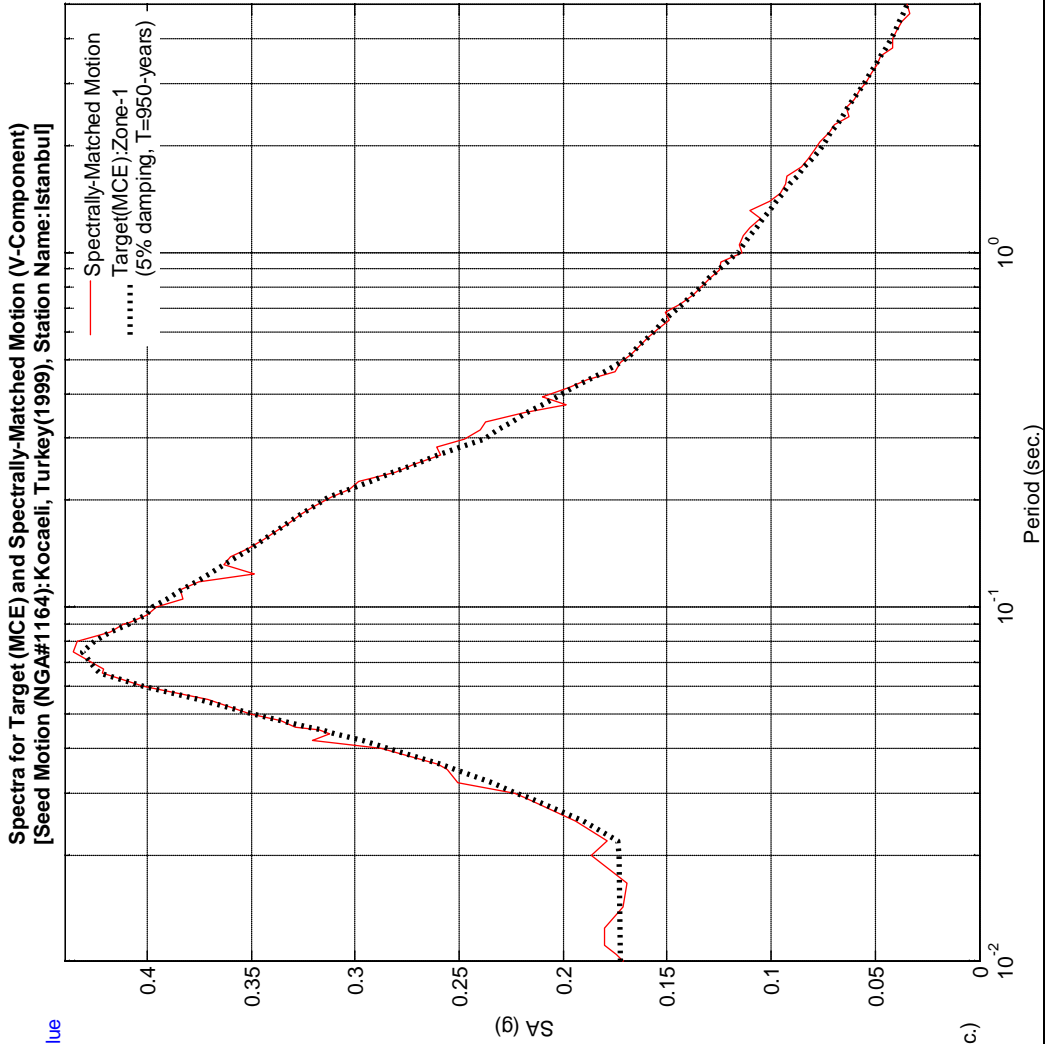


HSR 13-06 - EXECUTION VERSION









HSR 13-06 - EXECUTION VERSION

Table A.1: Ground Motion Metrics for Selected Seed and Spectrally-Matched Motions for Zone 2

Set	NGA #	Selected Seed Motions				Spectrally-Matched Motions							
		Earthquake Name	Year	Station Name	Mw	R	PGA H1 (g)	PGV H1 (cm/s)	PGD H1 (cm)	PGA H2 (g)	PGV H2 (cm/s)	PGD H2 (cm)	PGD V (cm)
1	882	Landers	1992	North Palm Springs	7.28	26.84	0.219	17.687	8.392	0.209	18.526	11.318	5.827
2	1776	Hector Mine	1999	Desert Hot Springs	7.13	56.4	0.224	21.705	16.181	0.217	23.532	13.548	6.798
3	2112	Denali, Alaska	2002	TAPS Pump Station #08	7.9	104.94	0.209	25.200	14.368	0.211	22.205	18.558	13.295
4	1637	Manjil, Iran	1990	Rudsar	7.37	64.47	0.221	18.139	6.612	0.220	21.078	8.912	6.650
5	169	Imperial Valley-06	1979	Delta	6.53	22.03	0.222	17.558	11.549	0.221	17.819	9.705	6.869
6	1208	Chi-Chi, Taiwan	1999	CHY046	7.62	24.11	0.204	21.676	11.829	0.215	19.619	14.422	11.634
7	1164	Kocaeli, Turkey	1999	Istanbul	7.51	51.95	0.225	26.255	46.268	0.215	37.373	29.092	27.724

SC SOLUTIONS

PROJ. NO:
BY:
QC CHECK:
QA CHECK:
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M. Perez
V. Jacob
09/07/2012

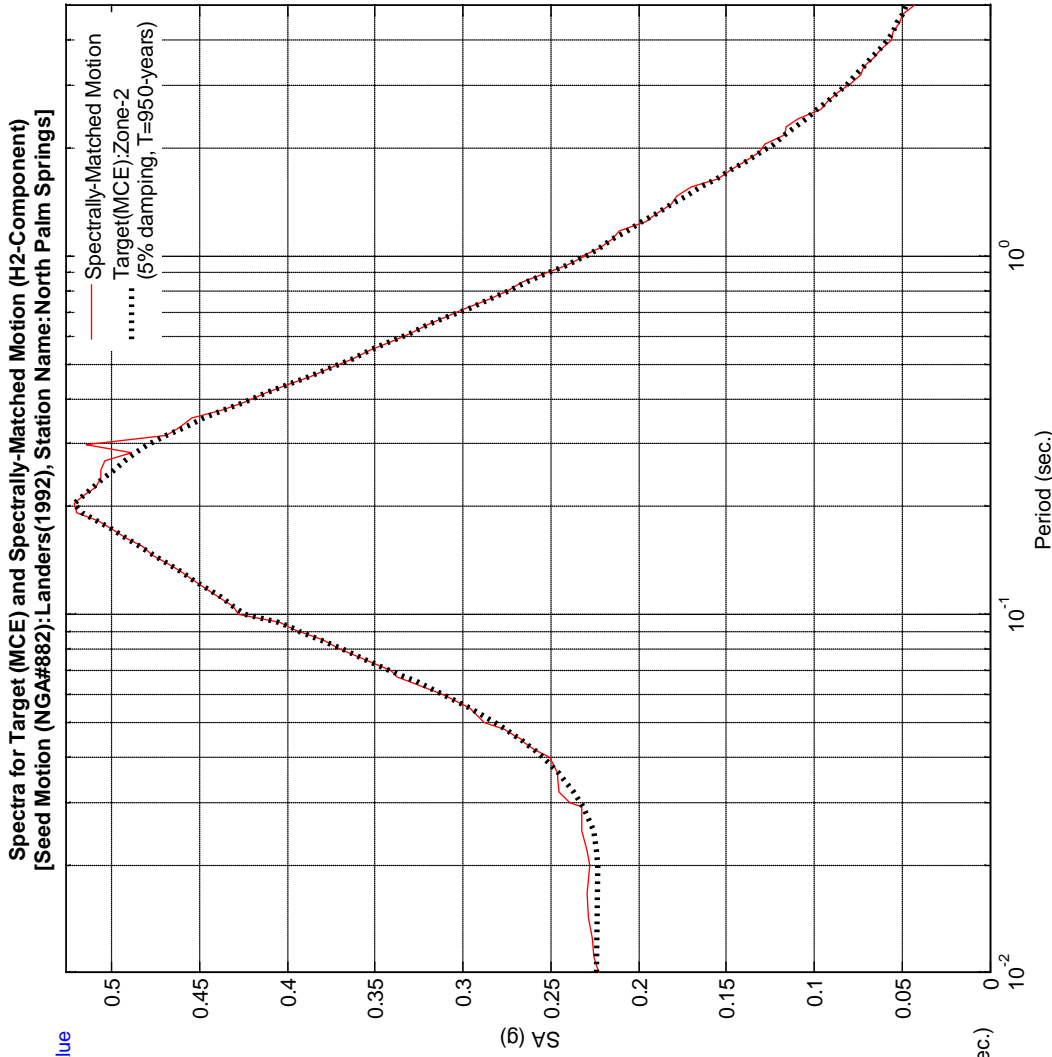
**SELECTED SEED AND
SPECTRALLY-MATCHED MOTIONS**
MCE – ZONE 2

CALIFORNIA HIGH SPEED TRAIN PROJECT
MERCED TO FRESNO, CALIFORNIA

PLATE

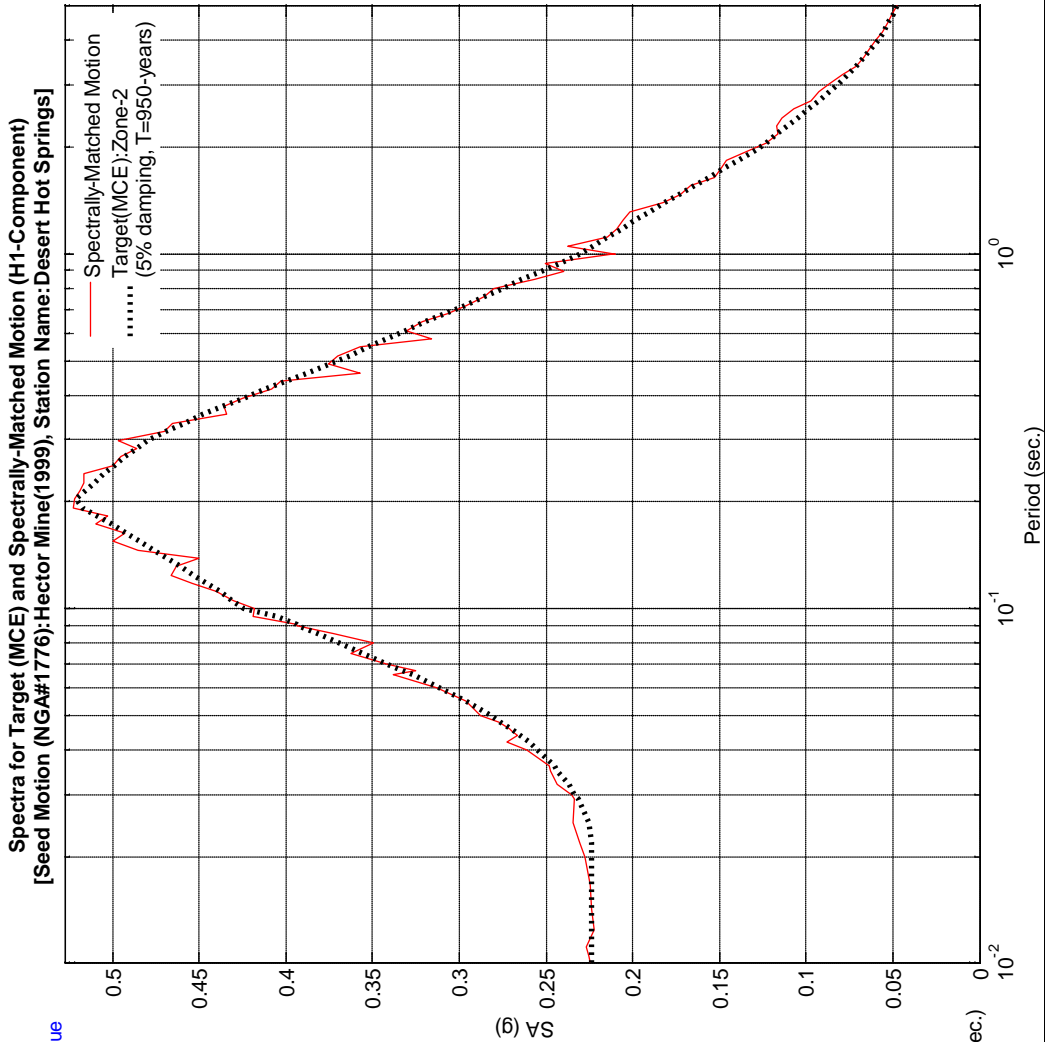
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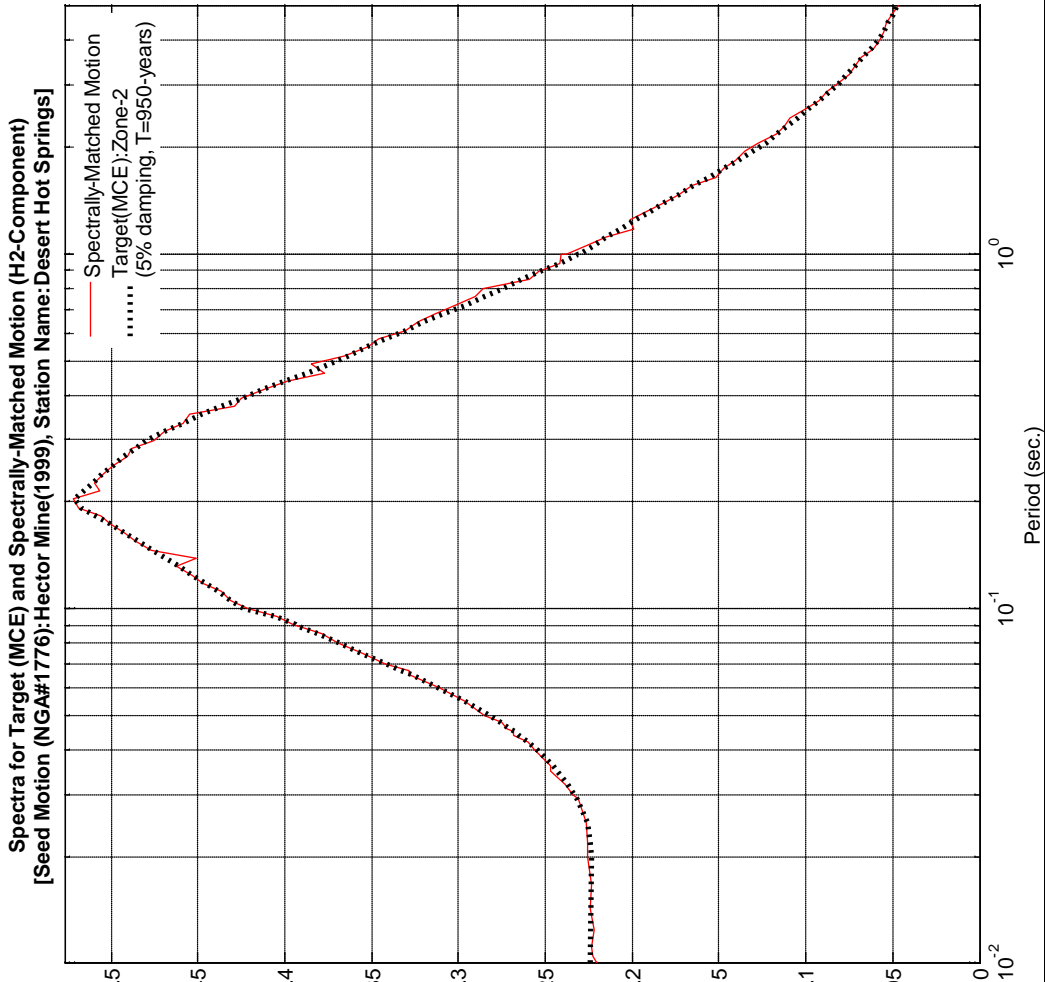


SC SOLUTIONS



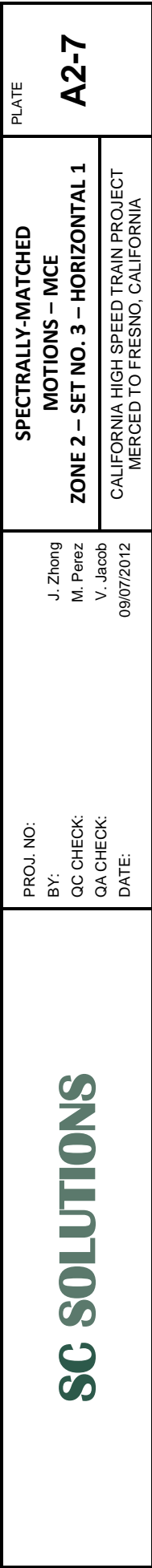


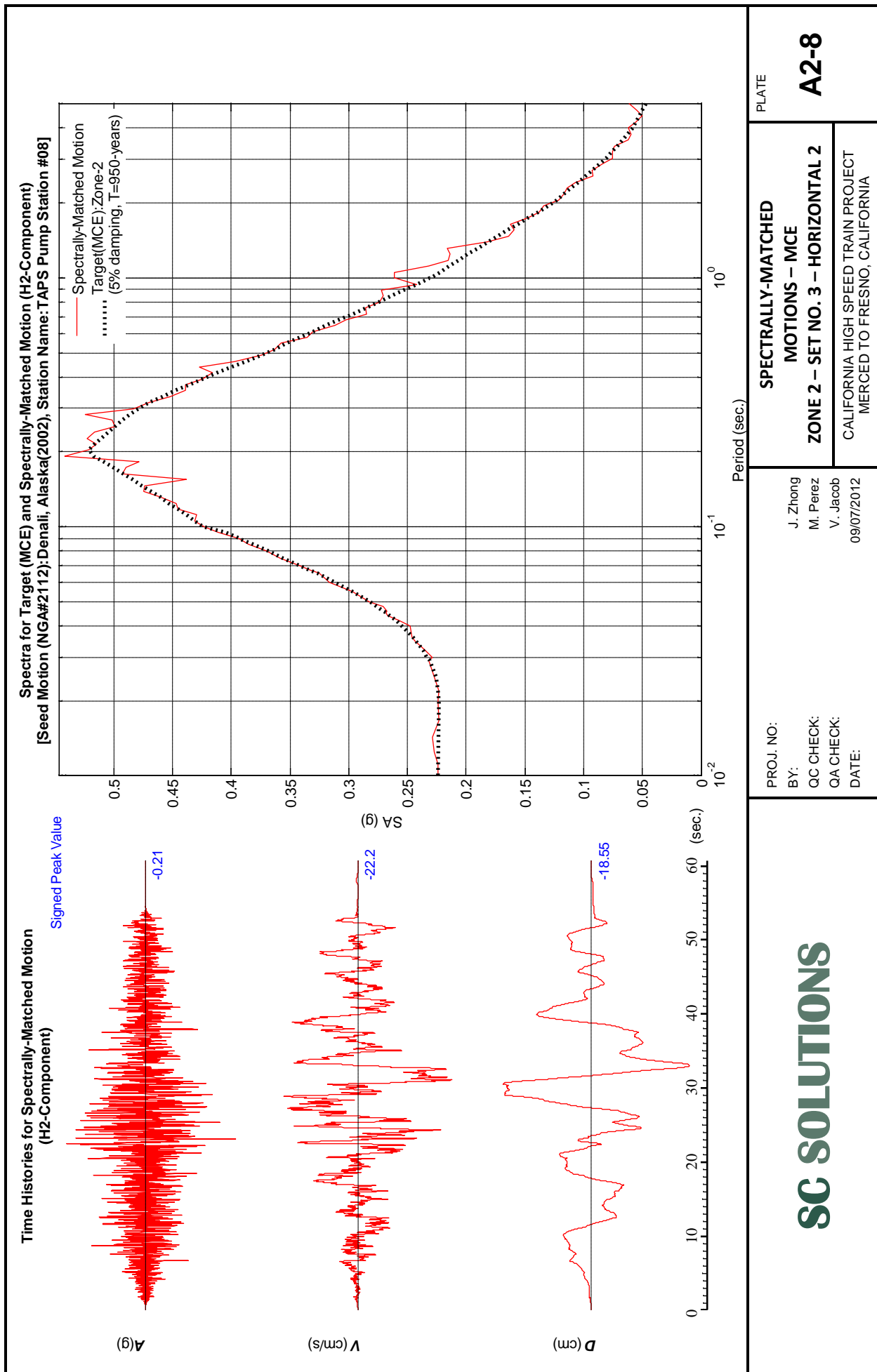
HSR 13-06 - EXECUTION VERSION

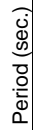


HSR 13-06 - EXECUTION VERSION









PLATE

MOTIONS – MCE

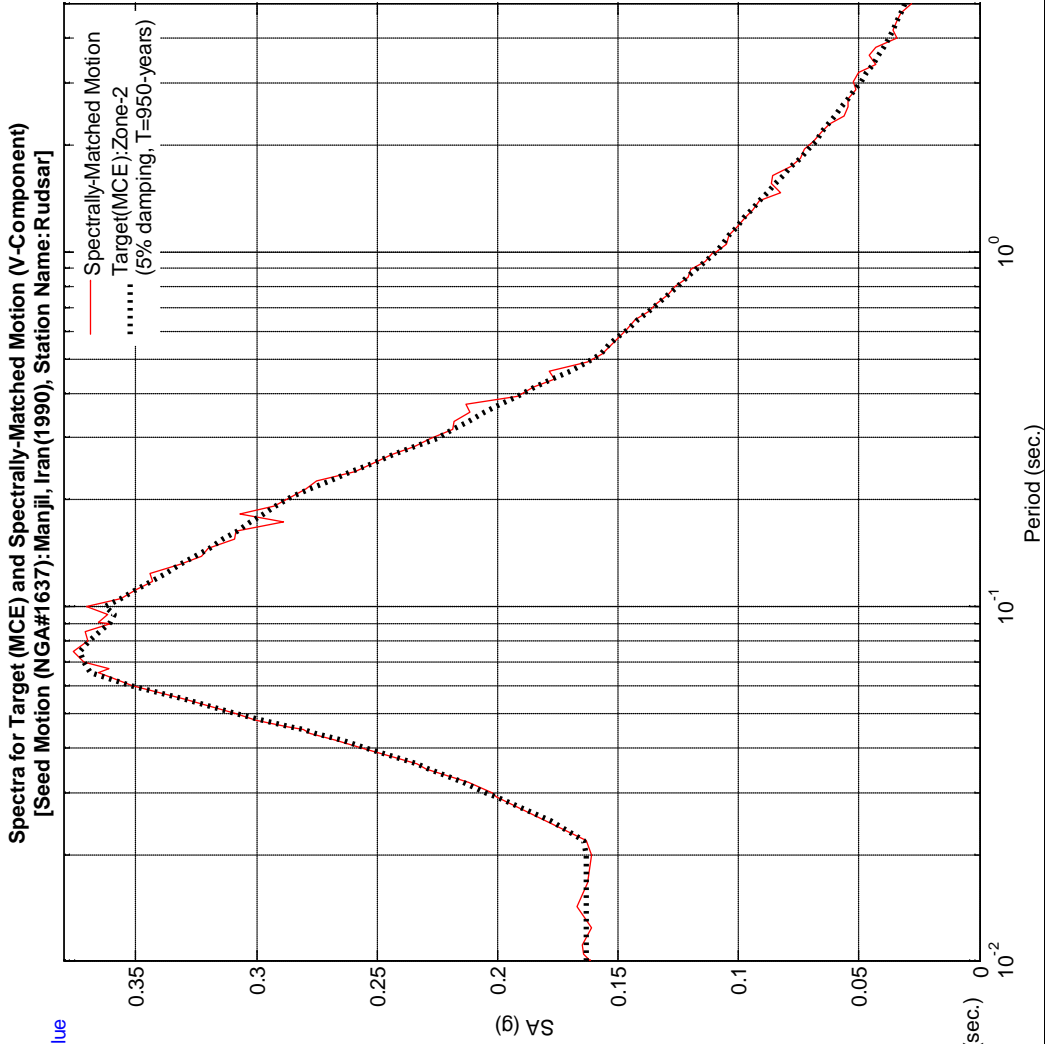
ZONE 2 – SET NO. 3 – VERTICAL

CALIFORNIA HIGH SPEED TRAIN PROJECT
MERCED TO FRESNO, CALIFORNIA

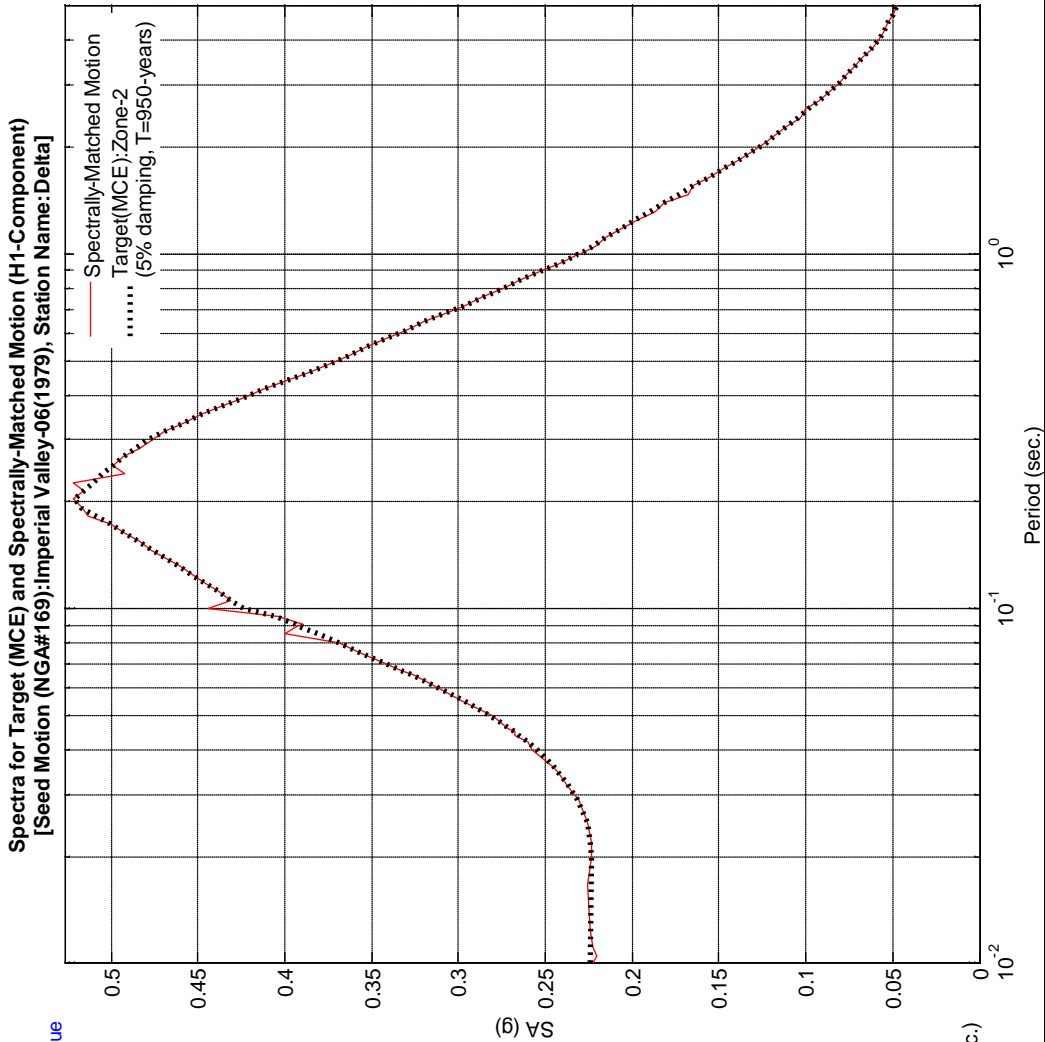
SC SOLUTIONS







HSR 13-06 - EXECUTION VERSION



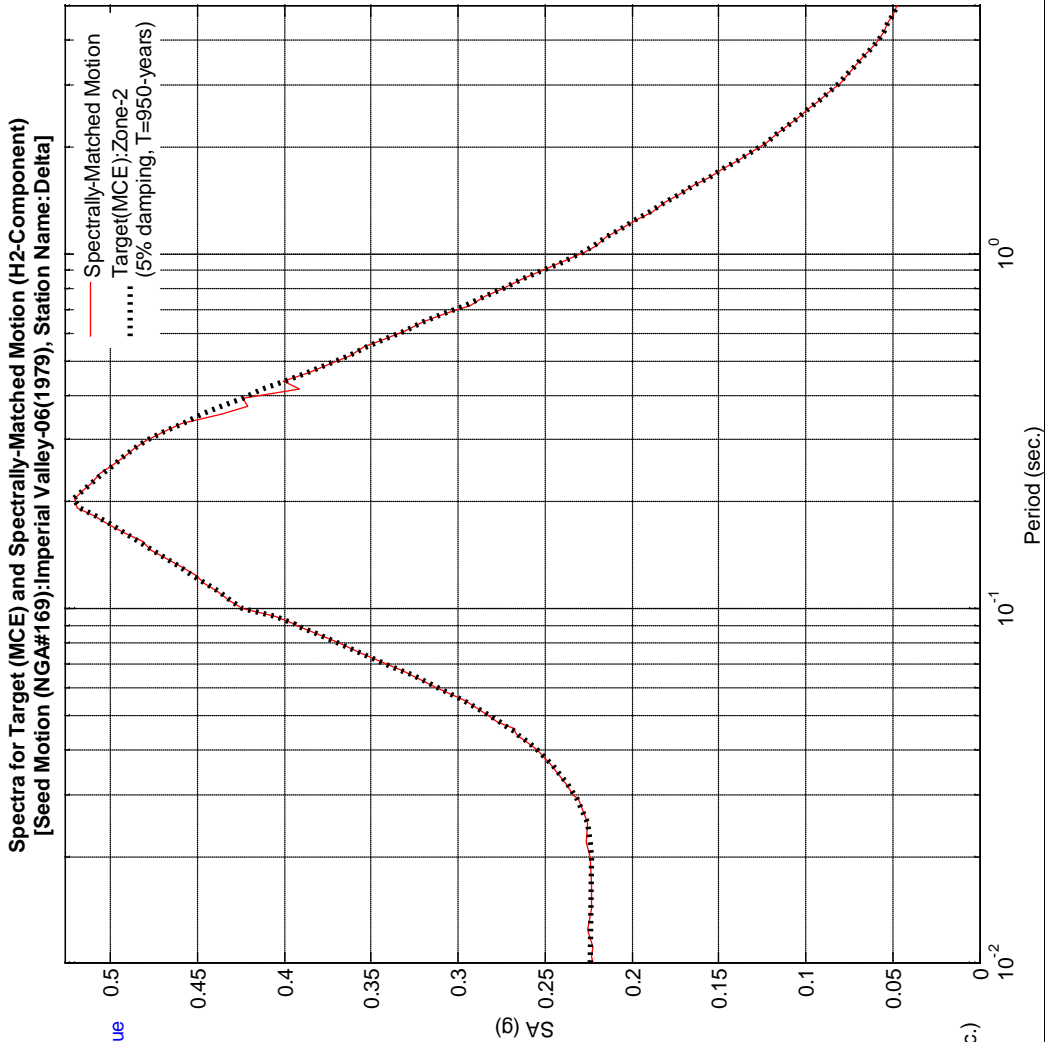
SC SOLUTIONS

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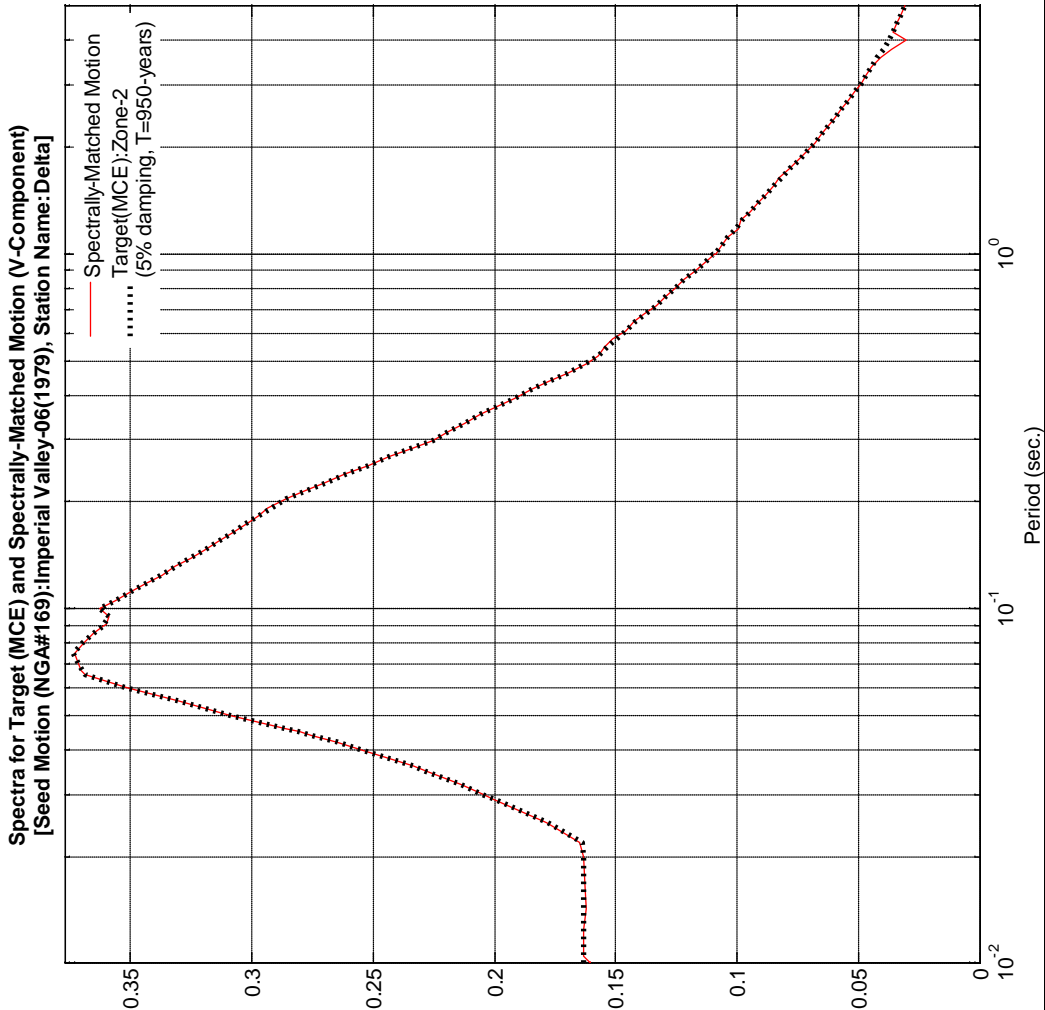
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ZONE 2 – SET NO. 5 – HORIZONTAL 1

CALIFORNIA HIGH SPEED TRAIN PROJECT
MERCED TO FRESNO, CALIFORNIA



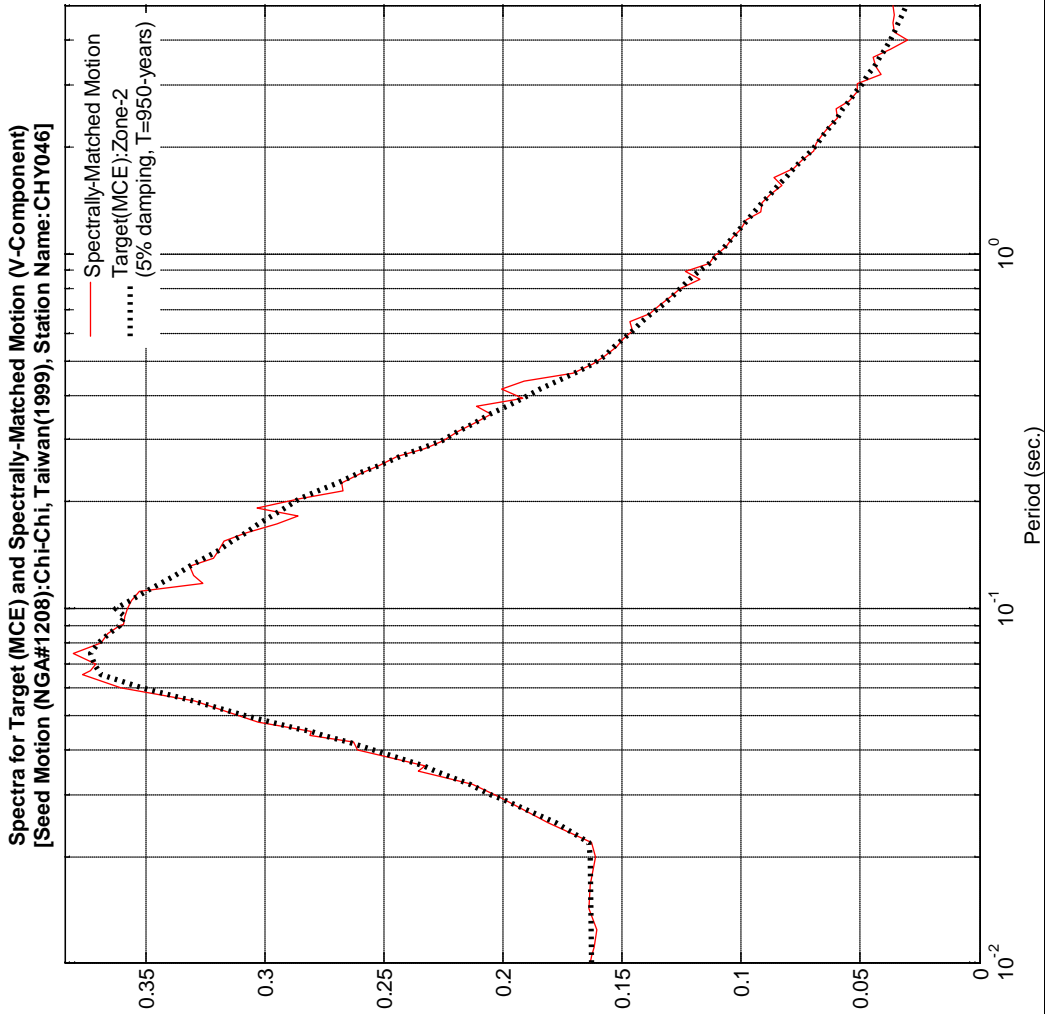
HSR 13-06 - EXECUTION VERSION



HSR 13-06 - EXECUTION VERSION







HSR 13-06 - EXECUTION VERSION







Table A.1: Ground Motion Metrics for Selected Seed and Spectrally-Matched Motions for Zone 3

Set	NGA #	Selected Seed Motions				Spectrally-Matched Motions									
		Earthquake Name	Year	Station Name	Mw	R	PGA H1 (g)	PGV H1 (cm/s)	PGD H1 (cm)	PGA H2 (g)	PGV H2 (cm/s)	PGD H2 (cm)	PGA V (g)	PGV V (cm/s)	PGD V (cm)
1	882	Landers	1992	North Palm Springs	7.28	26.84	0.210	15.246	7.014	0.201	16.817	10.560	0.148	9.770	5.631
2	1776	Hector Mine	1999	Desert Hot Springs	7.13	56.4	0.222	22.606	16.909	0.210	20.068	10.879	0.149	10.174	6.881
3	2112	Denali, Alaska	2002	TAPS Pump Station #08	7.9	104.94	0.209	21.629	13.857	0.203	21.456	16.735	0.137	12.403	12.598
4	1637	Manjil, Iran	1990	Rudsar	7.37	64.47	0.216	16.079	8.597	0.206	17.305	8.425	0.149	9.090	6.416
5	169	Imperial Valley-06	1979	Delta	6.53	22.03	0.212	15.578	10.727	0.209	15.009	8.302	0.150	9.324	6.299
6	1208	Chi-Chi, Taiwan	1999	CHY046	7.62	24.11	0.201	18.828	11.146	0.199	17.942	13.166	0.143	14.552	11.677
7	1164	Kocaeli, Turkey	1999	Istanbul	7.51	51.95	0.208	26.006	46.809	0.209	31.223	27.305	0.157	19.786	27.413

SC SOLUTIONS

PROJ. NO:
BY:
QC CHECK:
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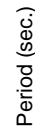
J. Zhong
M. Perez
V. Jacob
09/07/2012

**SELECTED SEED AND
SPECTRALLY-MATCHED MOTIONS**
MCE – ZONE 3

CALIFORNIA HIGH SPEED TRAIN PROJECT
MERCED TO FRESNO, CALIFORNIA

PLATE

A3-0



PLATE

A3-1

CALIFORNIA HIGH SPEED TRAIN PROJECT
MERCED TO FRESNO, CALIFORNIA

SC SOLUTIONS



PROJ. NO:
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QA CHECK:
DATE:

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PLATE

**SPECTRALLY-MATCHED
MOTIONS – MCE**

ZONE 3 – SET NO. 1 – HORIZONTAL 2
CALIFORNIA HIGH SPEED TRAIN PROJECT
MERCED TO FRESNO, CALIFORNIA

A3-2



PROJ. NO:
BY:
QC CHECK:
QA CHECK:
DATE:

HSR 13-06 - EXECUTION VERSION

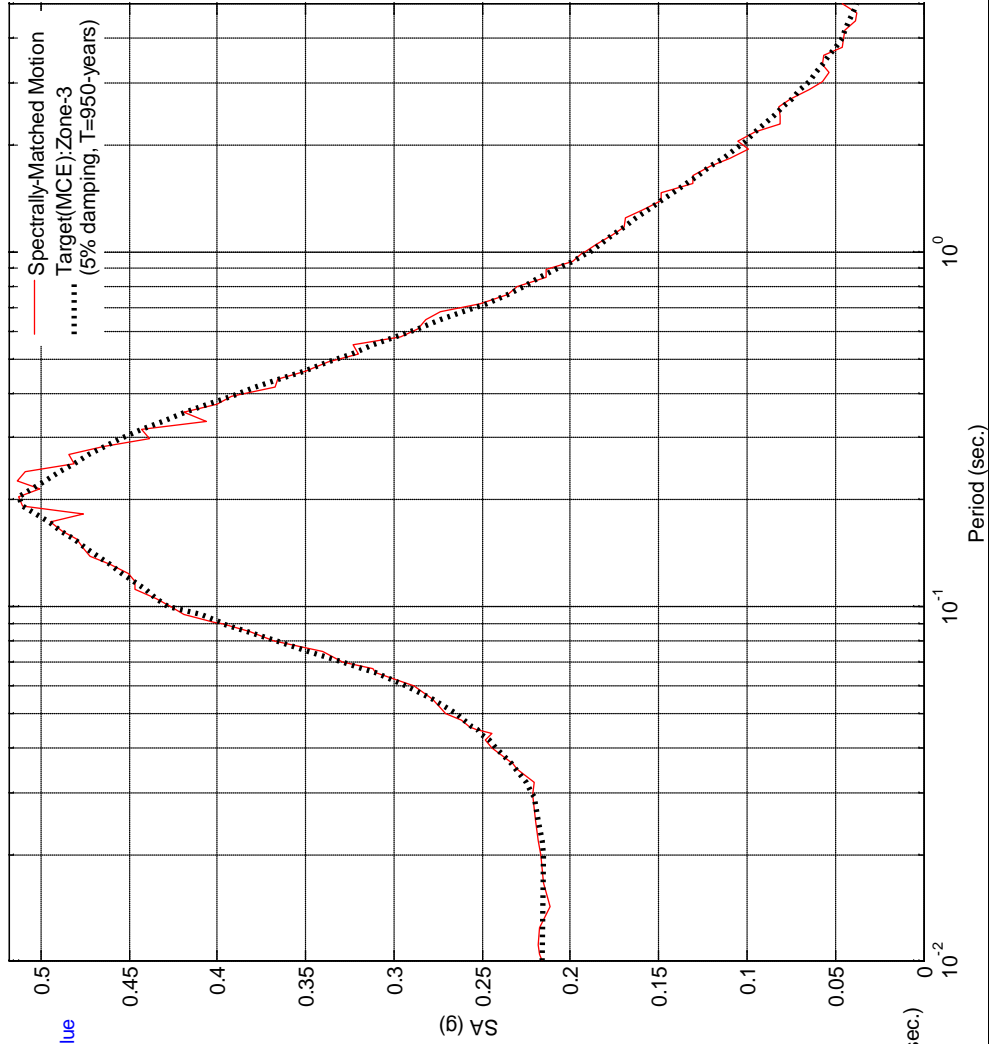
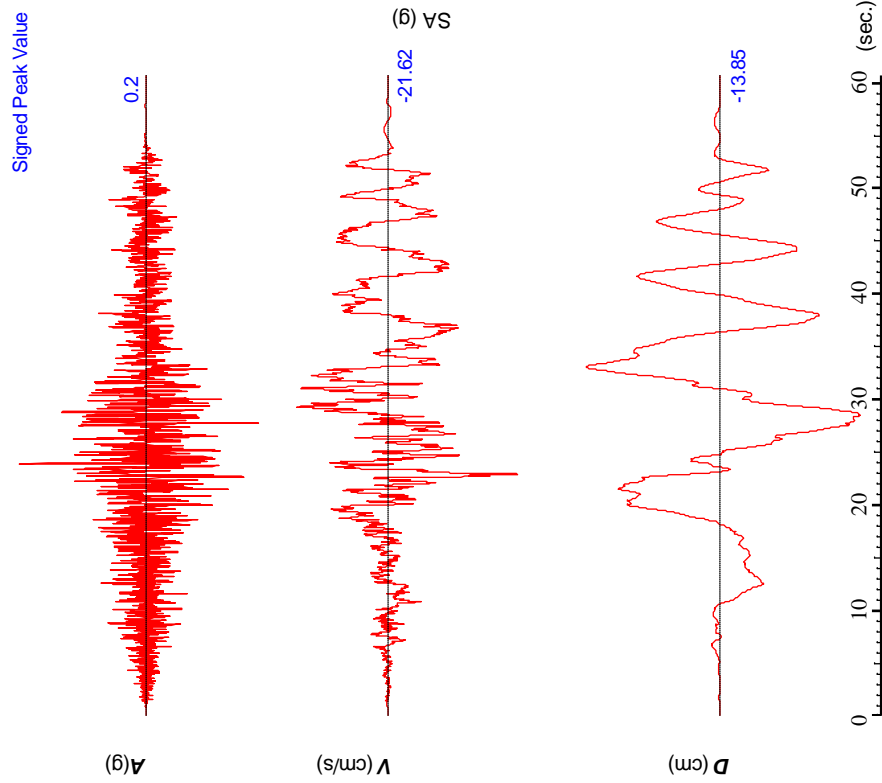




CALIFORNIA HIGH SPEED TRAIN PROJECT
MERCED TO FRESNO, CALIFORNIA

A3-5





SC SOLUTIONS

PROJ. NO:
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QA CHECK:
DATE:

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**SPECTRALLY-MATCHED
MOTIONS – MCE**

ZONE 3 – SET NO. 3 – HORIZONTAL 1

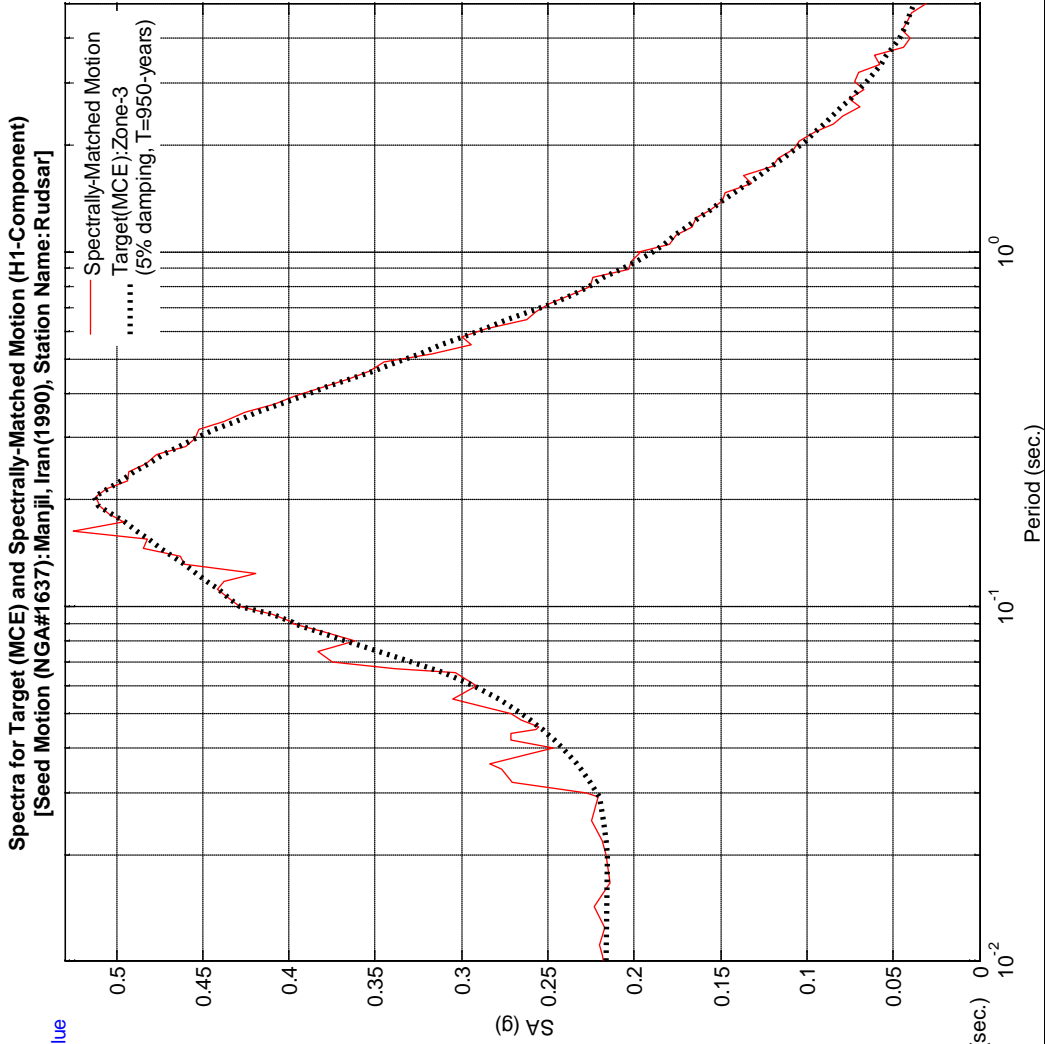
CALIFORNIA HIGH SPEED TRAIN PROJECT
MERCED TO FRESNO, CALIFORNIA

PLATE

A3-7







SC SOLUTIONS

PROJ. NO:
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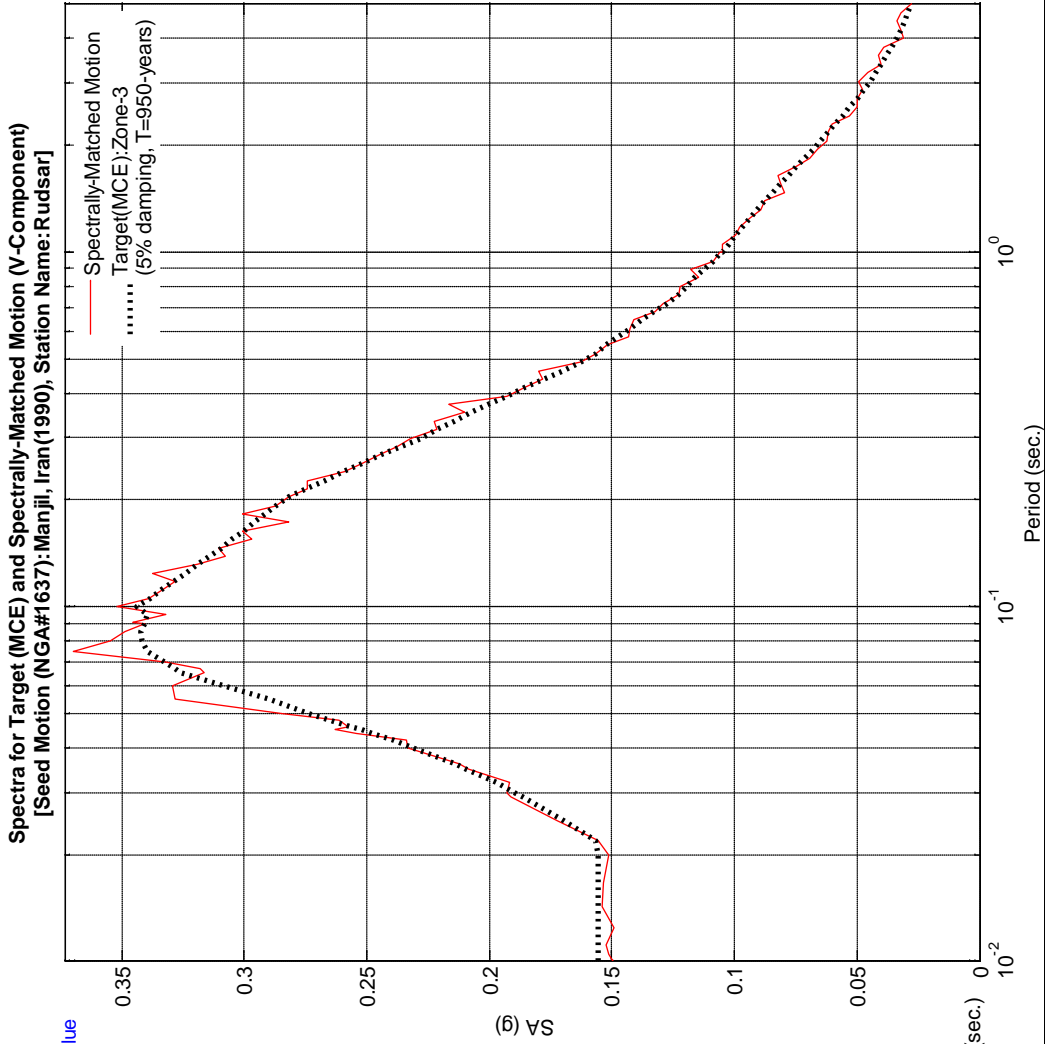
**SPECTRALLY-MATCHED
MOTIONS – MCE**

ZONE 3 – SET NO. 4 – HORIZONTAL 1

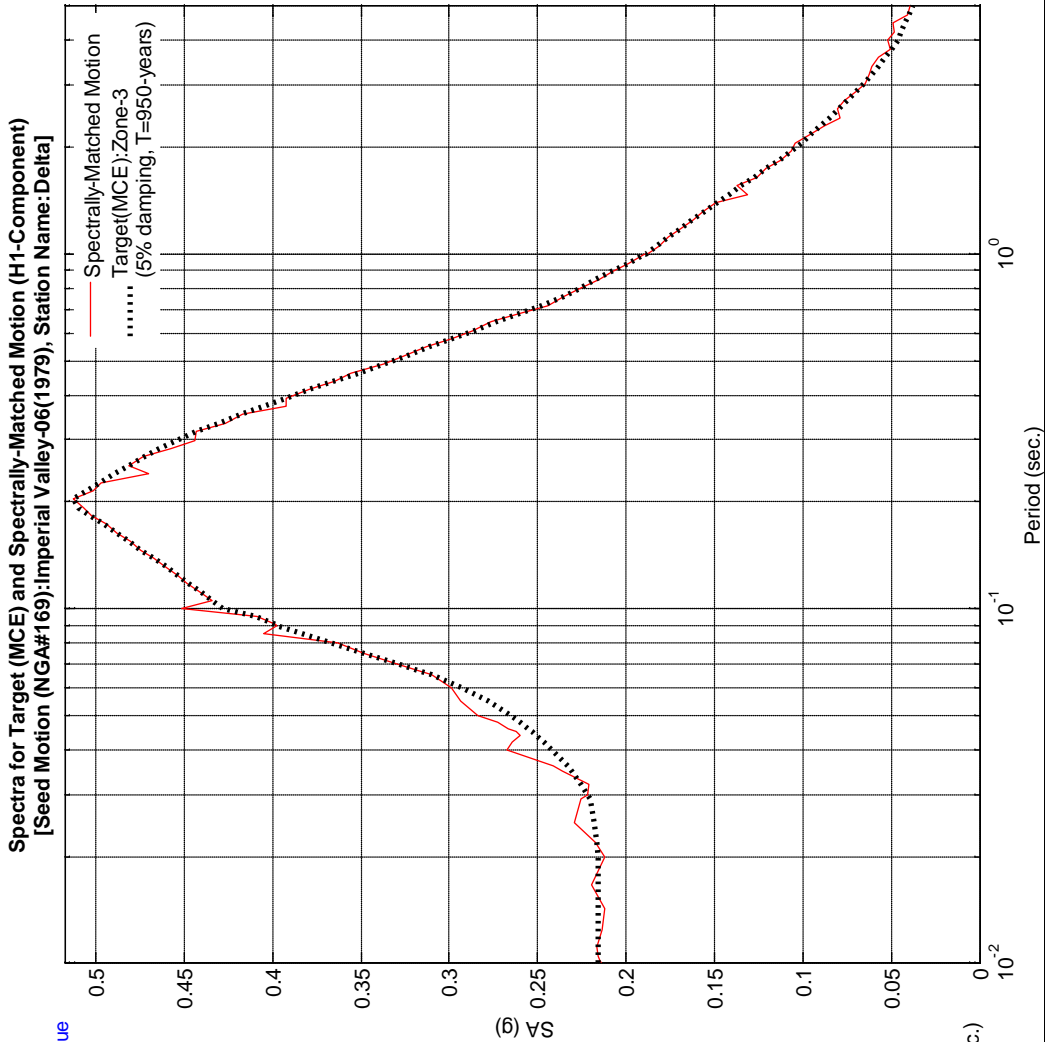
CALIFORNIA HIGH SPEED TRAIN PROJECT
MERCED TO FRESNO, CALIFORNIA

PLATE

A3-10



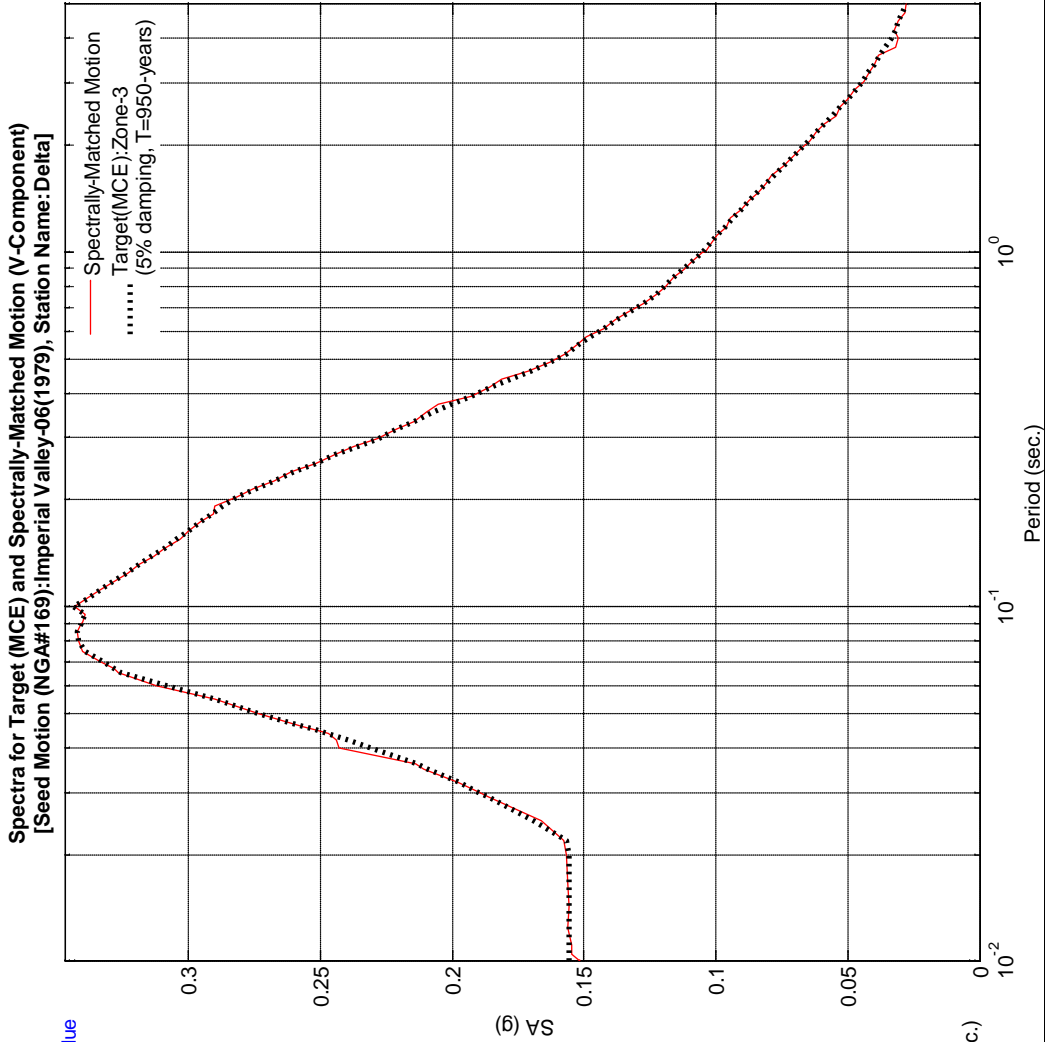
HSR 13-06 - EXECUTION VERSION



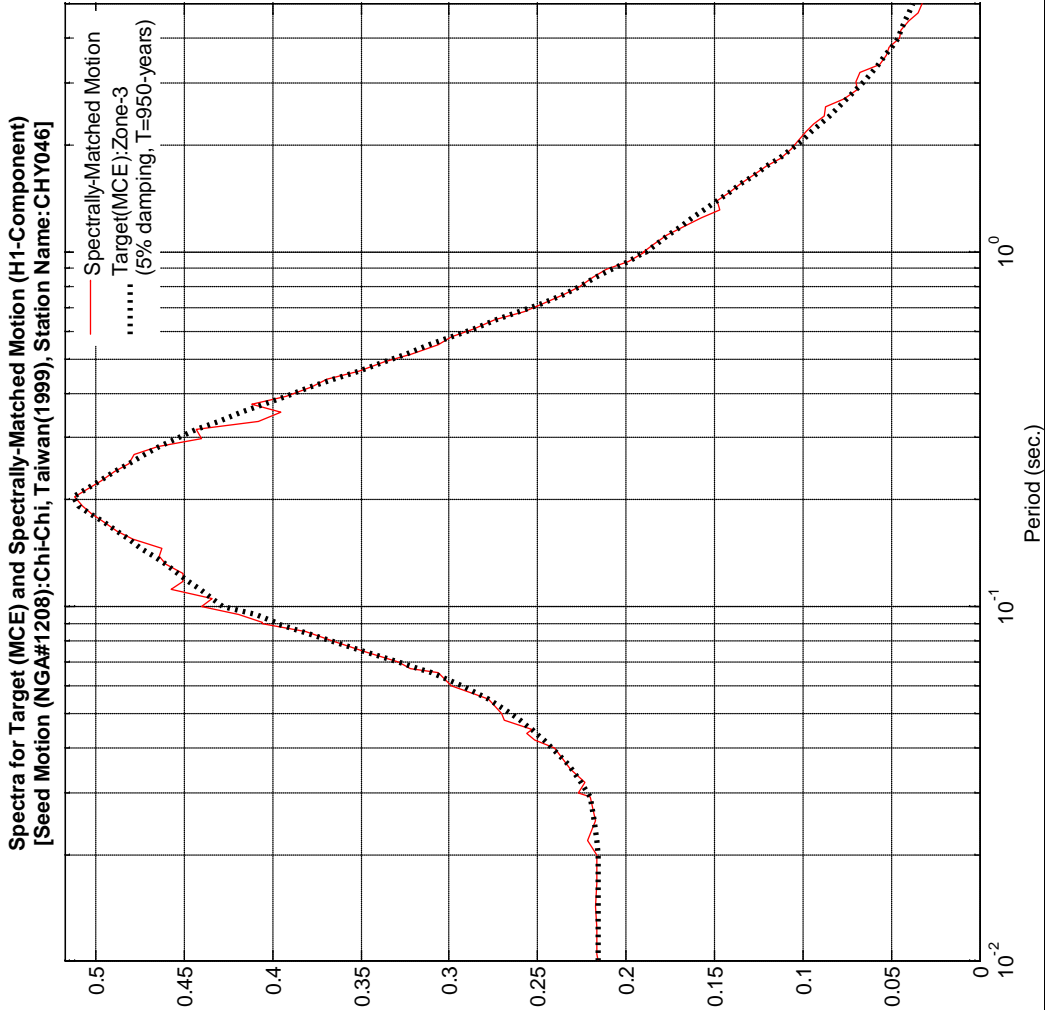
HSR 13-06 - EXECUTION VERSION



CALIFORNIA HIGH SPEED TRAIN PROJECT
MERCED TO FRESNO, CALIFORNIA



HSR 13-06 - EXECUTION VERSION

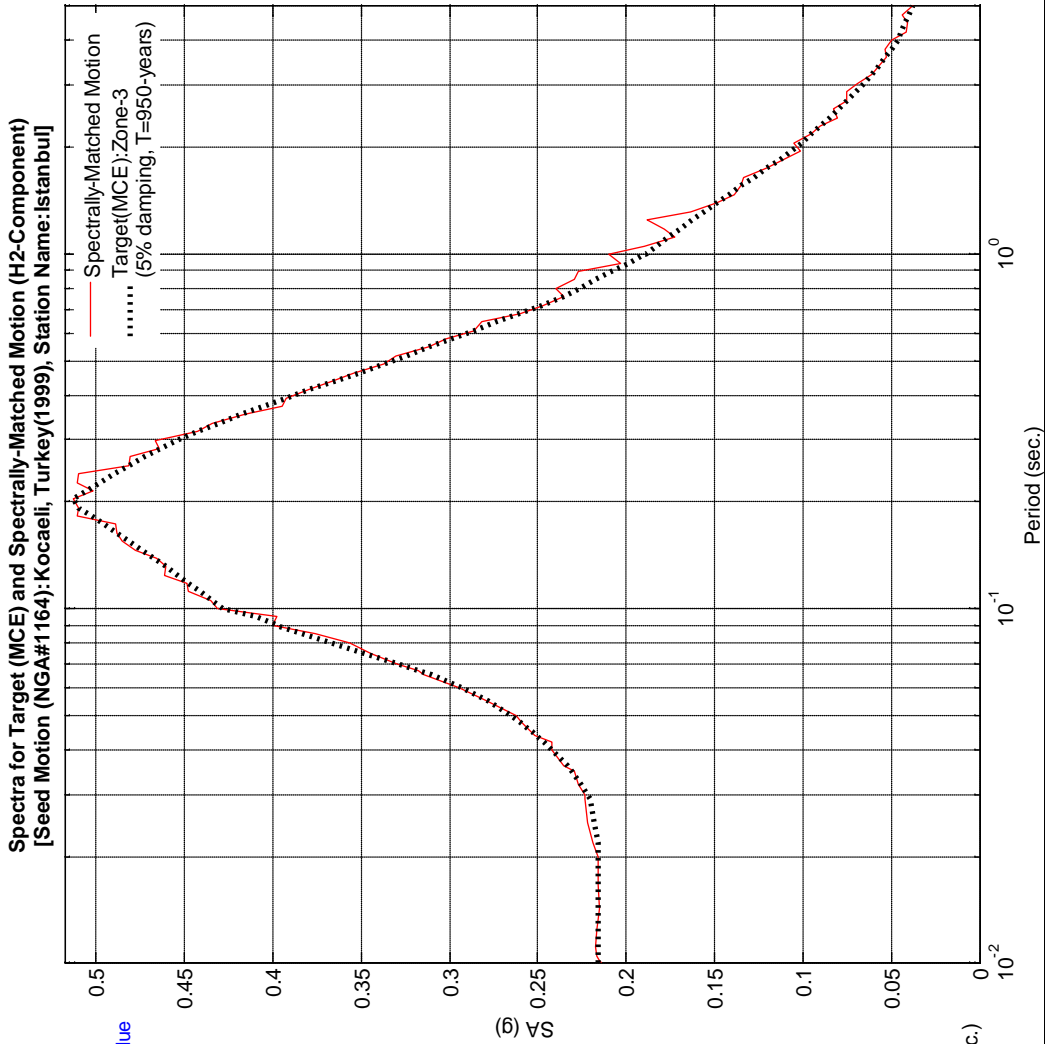


<div>SC SOLUTIONS</div>	PROJ. NO: BY: QC CHECK: QA CHECK: DATE:	J. Zhong M. Perez V. Jacob 09/07/2012	<div>SPECTRALLY-MATCHED MOTIONS – MCE ZONE 3 – SET NO. 6 – HORIZONTAL 1</div>	PLATE A3-16
			<div>CALIFORNIA HIGH SPEED TRAIN PROJECT MERCED TO FRESNO, CALIFORNIA</div>	

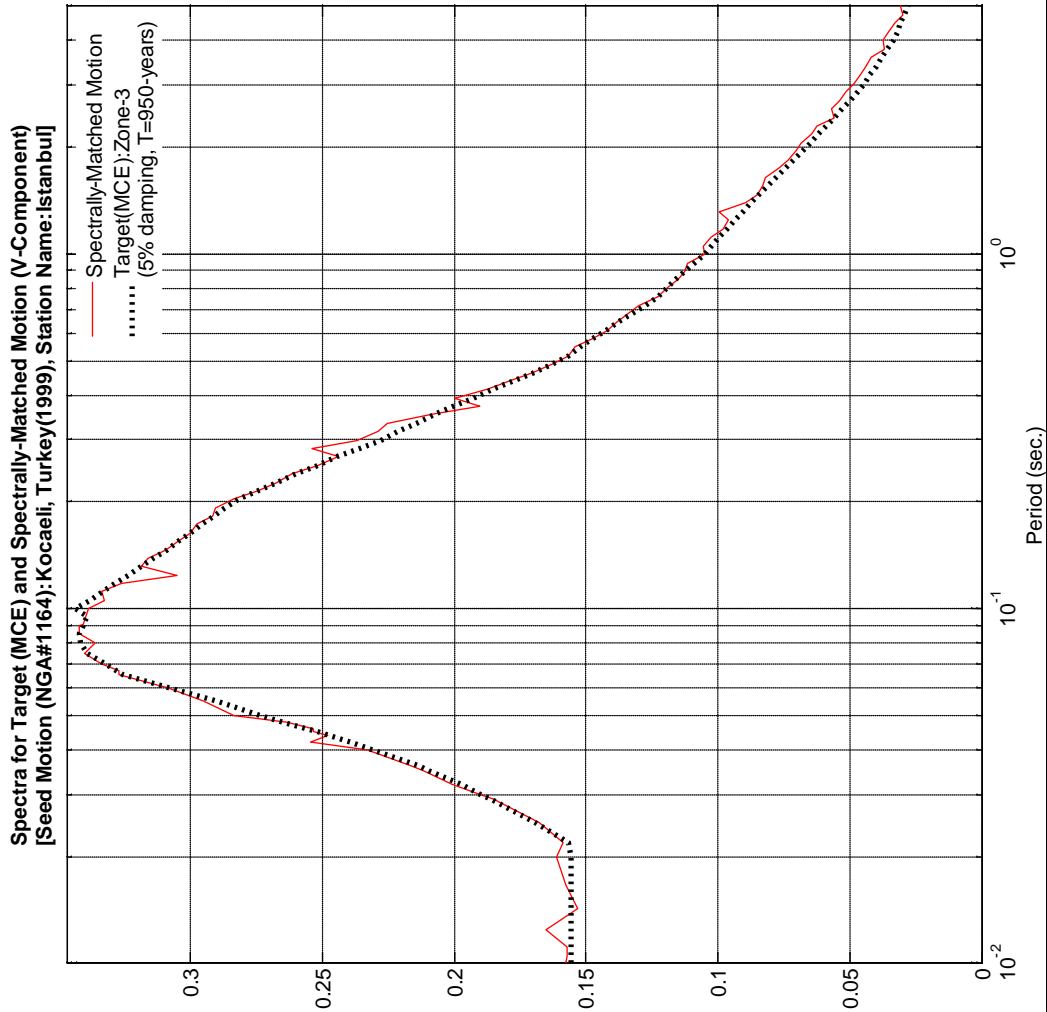








HSR 13-06 - EXECUTION VERSION



HSR 13-06 - EXECUTION VERSION

Table A.1: Ground Motion Metrics for Selected Seed and Spectrally-Matched Motions for Zone 4

Set	NGA #	Selected Seed Motions				Spectrally-Matched Motions							
		Earthquake Name	Year	Station Name	Mw	R	PGA H1 (g)	PGV H1 (cm/s)	PGD H1 (cm)	PGA H2 (g)	PGV H2 (cm/s)	PGD H2 (cm)	PGD V (cm)
1	882	Landers	1992	North Palm Springs	7.28	26.84	0.246	21.773	11.903	0.231	24.728	13.902	0.176
2	1776	Hector Mine	1999	Desert Hot Springs	7.13	56.4	0.255	26.564	18.960	0.245	29.871	17.992	0.181
3	2112	Denali, Alaska	2002	TAPS Pump Station #08	7.9	104.94	0.234	31.061	17.329	0.241	25.321	22.356	0.176
4	1637	Manjil, Iran	1990	Rudsar	7.37	64.47	0.251	24.790	9.618	0.243	24.259	10.299	0.191
5	169	Imperial Valley-06	1979	Delta	6.53	22.03	0.247	22.326	13.918	0.247	22.655	12.832	0.183
6	1208	Chi-Chi, Taiwan	1999	CHY046	7.62	24.11	0.231	25.069	15.086	0.239	26.395	18.400	0.171
7	1164	Kocaeli, Turkey	1999	Istanbul	7.51	51.95	0.253	35.603	57.596	0.254	44.151	33.956	0.182

SC SOLUTIONS

PROJ. NO:
BY:
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DATE:

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V. Jacob
09/07/2012

SELECTED SEED AND
SPECTRALLY-MATCHED MOTIONS

MCE – ZONE 4

CALIFORNIA HIGH SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD, CALIFORNIA

PLATE
A4-0



SC SOLUTIONS

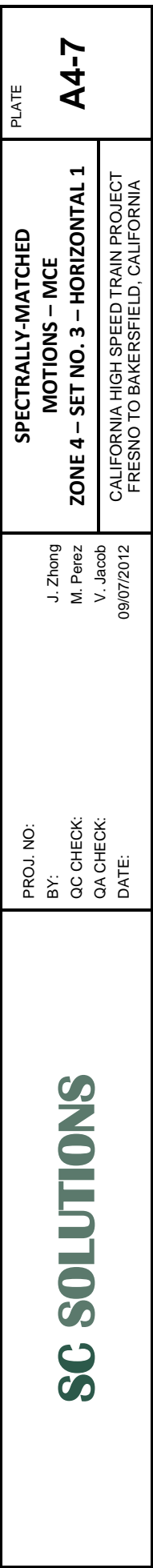


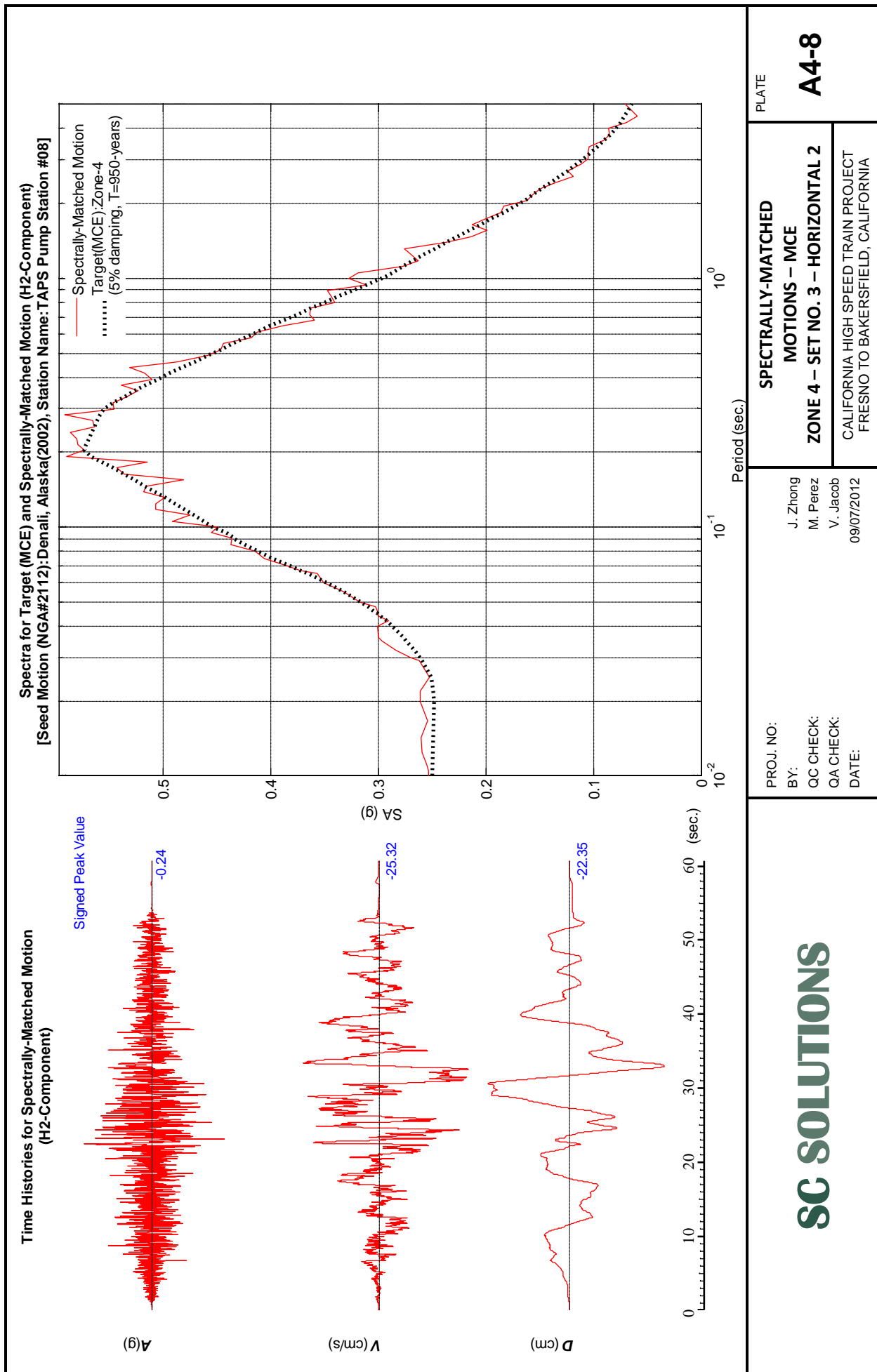


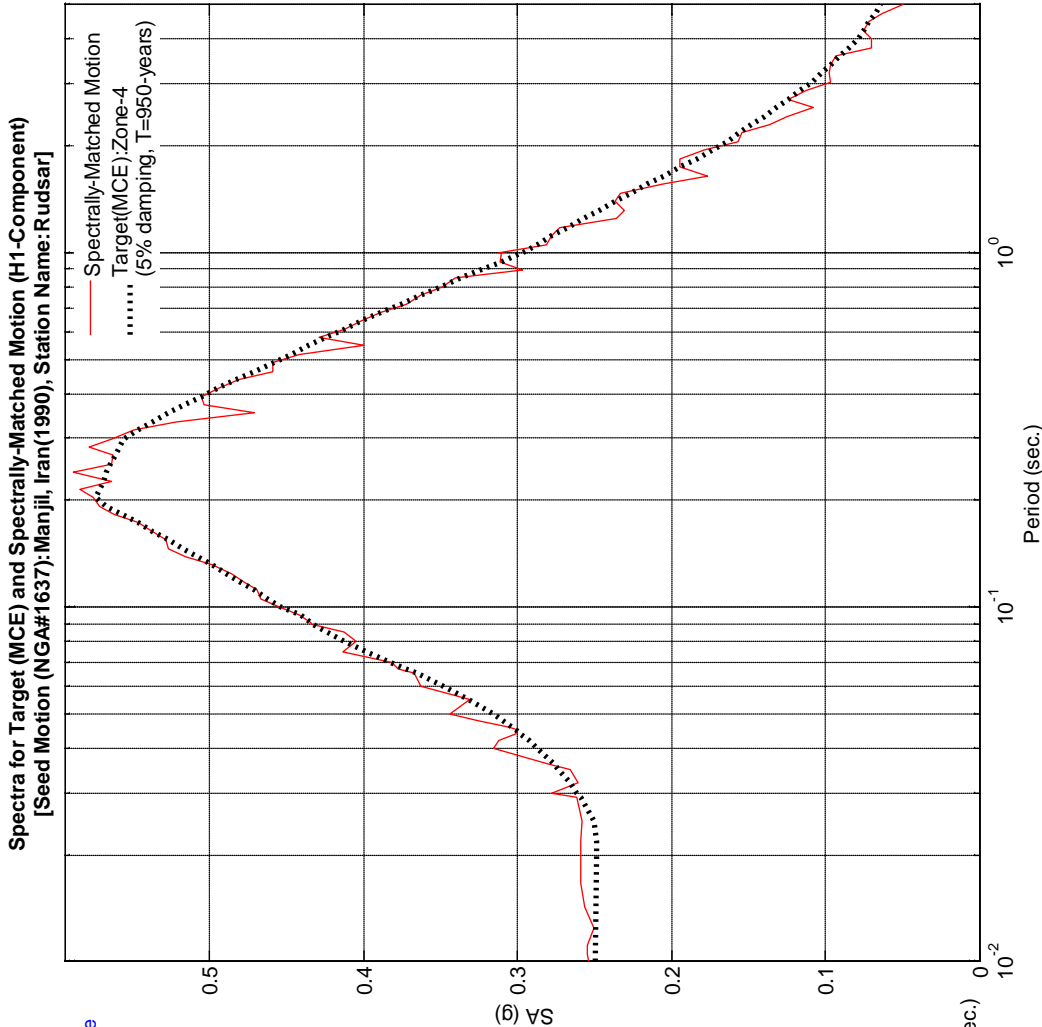












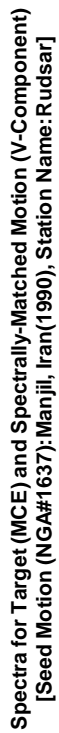
SC SOLUTIONS

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09/07/2012

A4-10

ZONE 4 – SET NO. 4 – HORIZONTAL 1

CALIFORNIA HIGH SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD, CALIFORNIA



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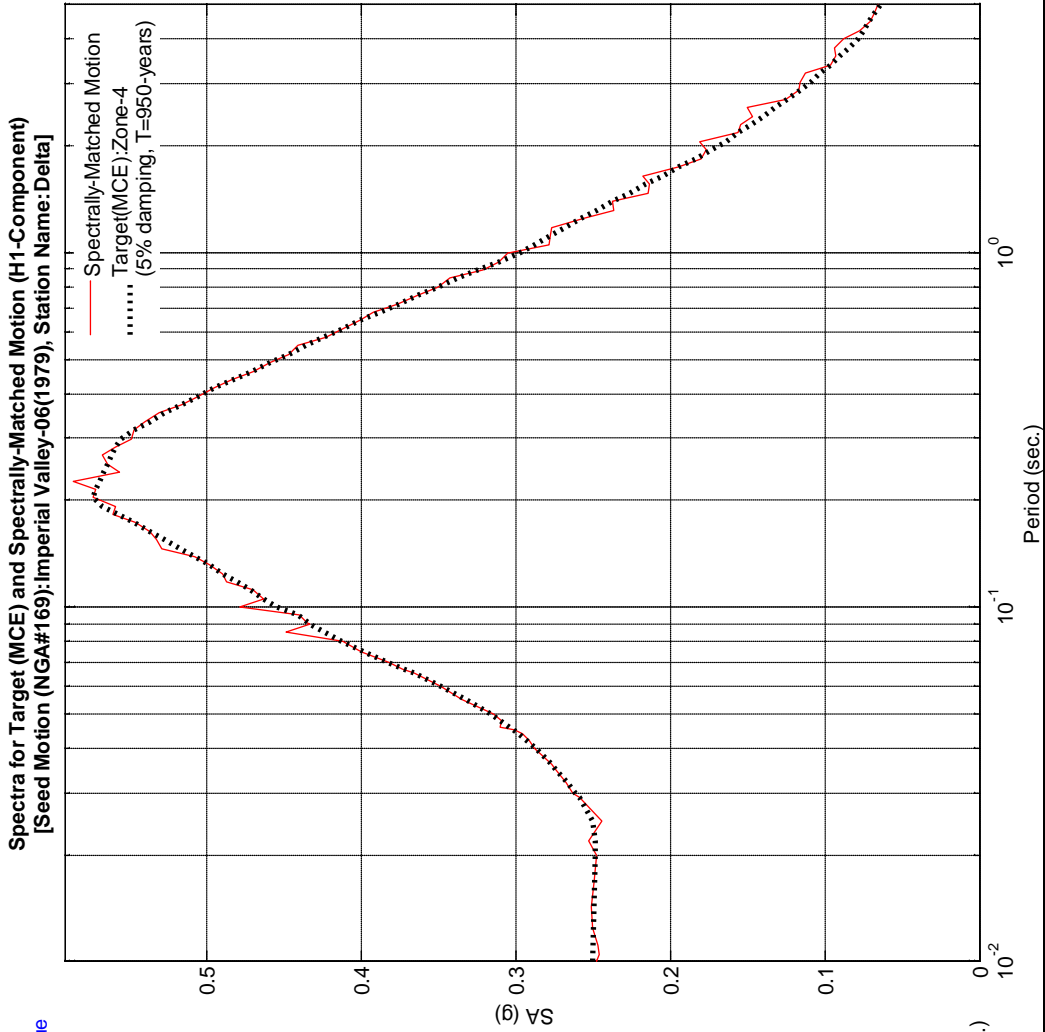
PLATE

SPECTRALLY-MATCHED
MOTIONS – MCE

SC SOLUTIONS

A4-12

CALIFORNIA HIGH SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD, CALIFORNIA



SC SOLUTIONS

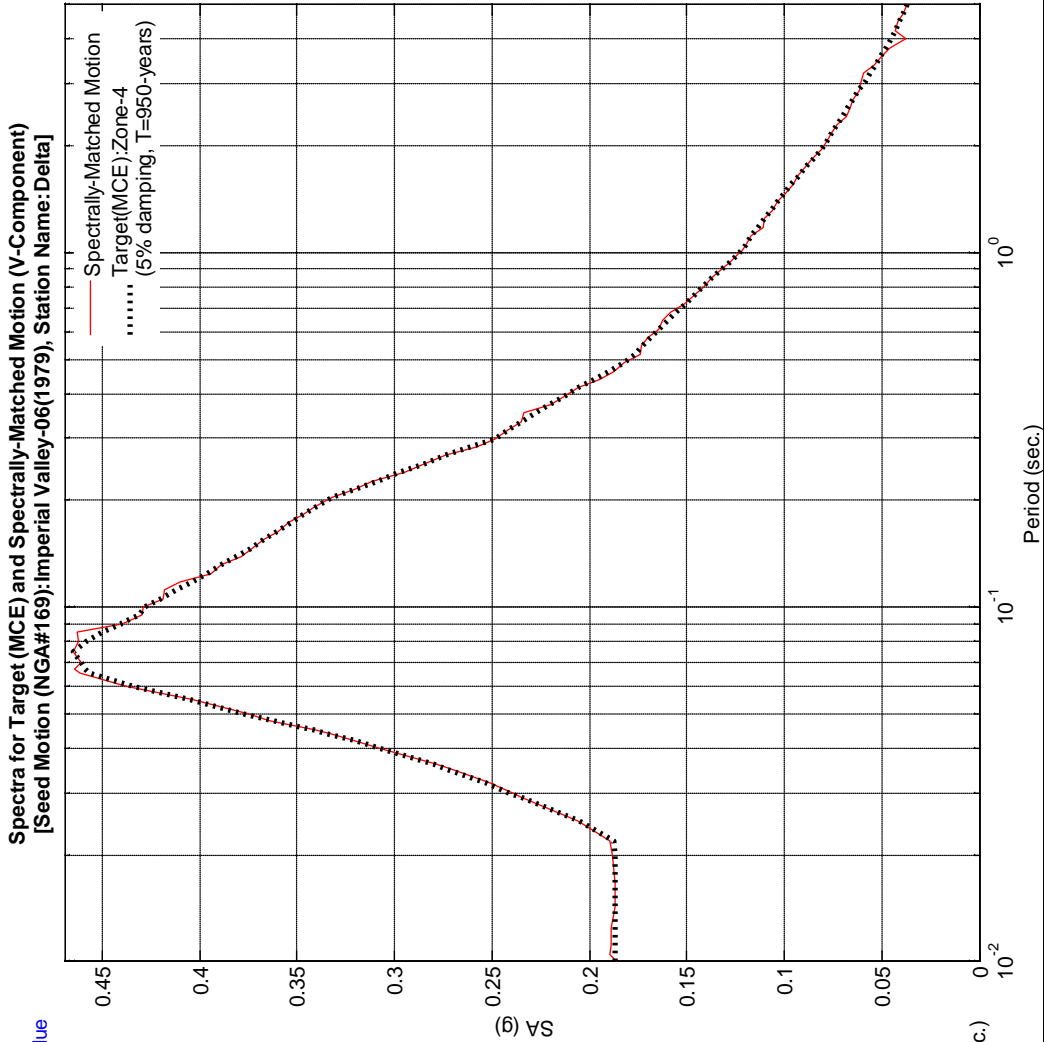
J. Zhong
M. Perez
V. Jacob
09/07/2012

ZONE 4 – SET NO. 5 – HORIZONTAL 1

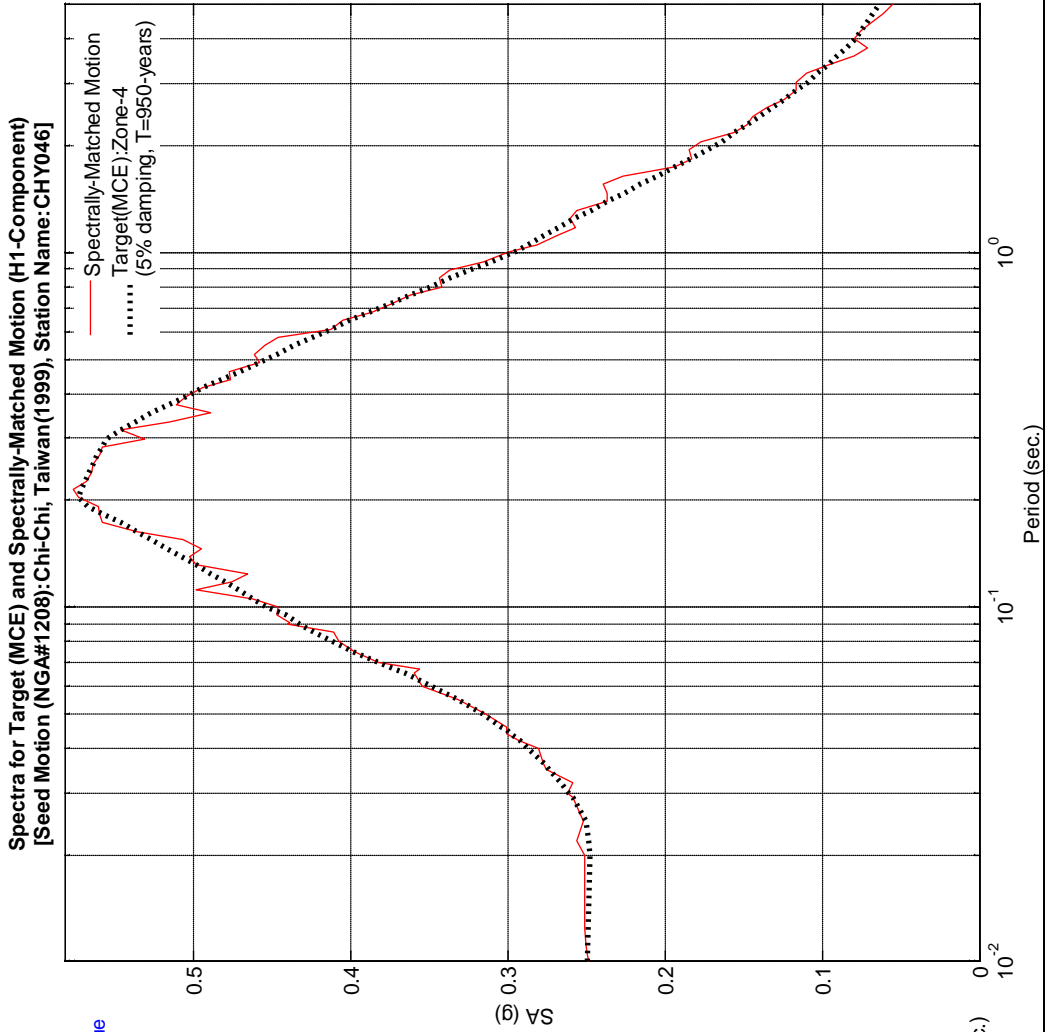
**CALIFORNIA HIGH SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD, CALIFORNIA**

PLATE

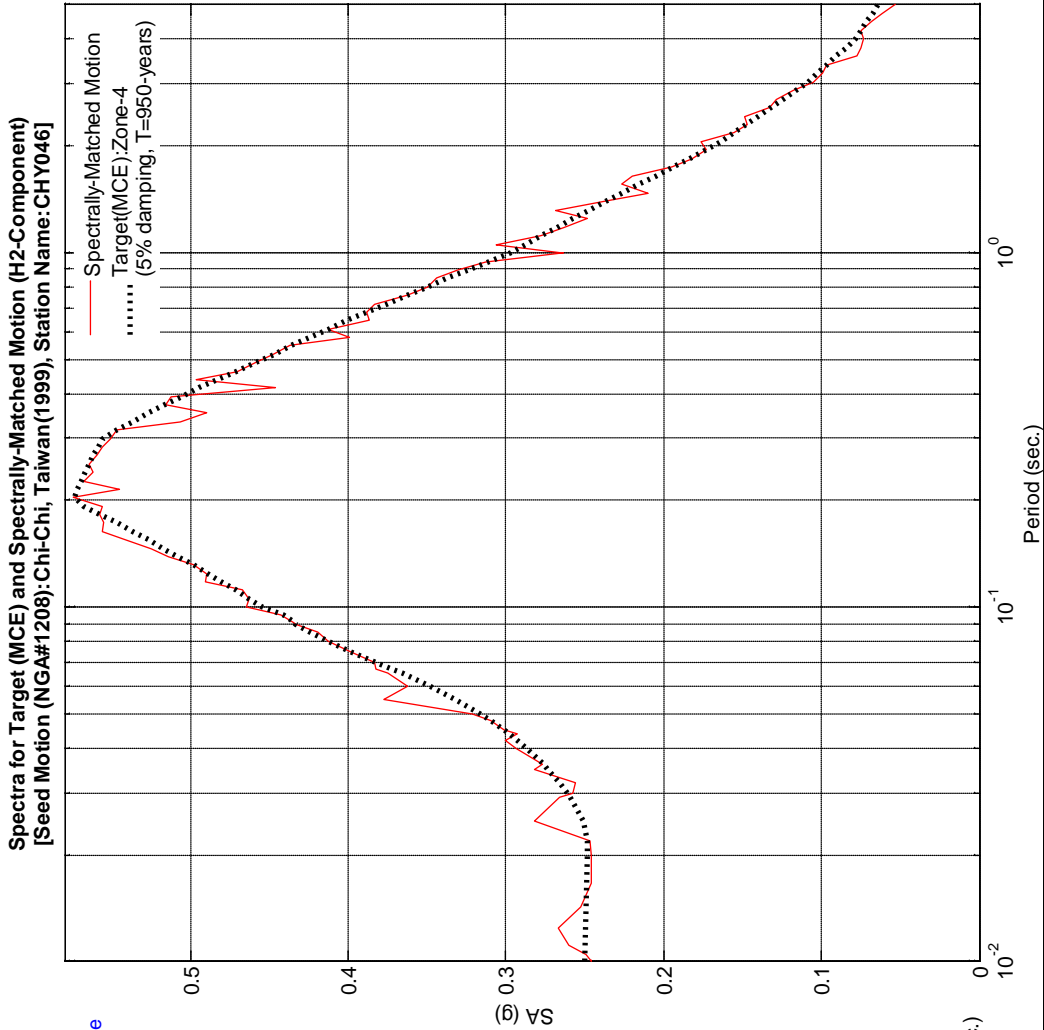
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HSR 13-06 - EXECUTION VERSION

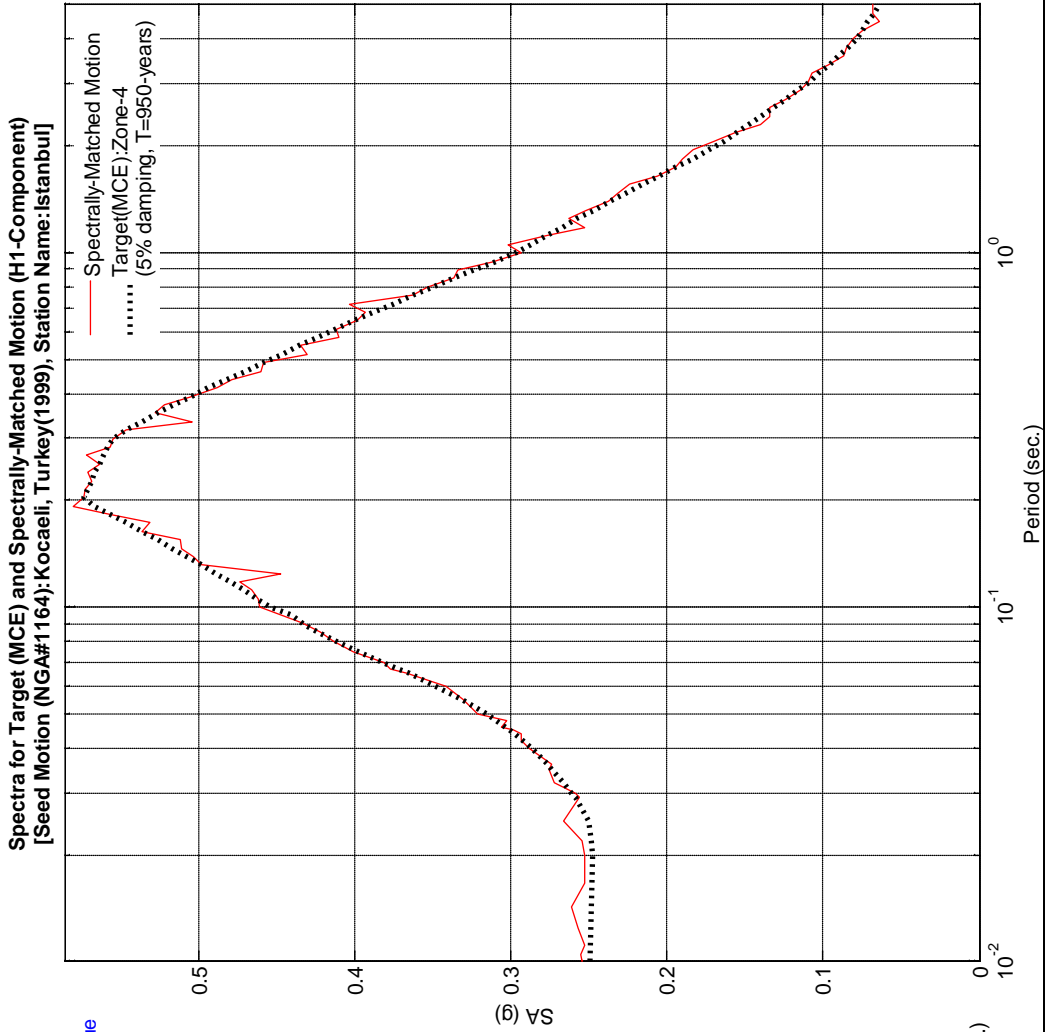


HSR 13-06 - EXECUTION VERSION

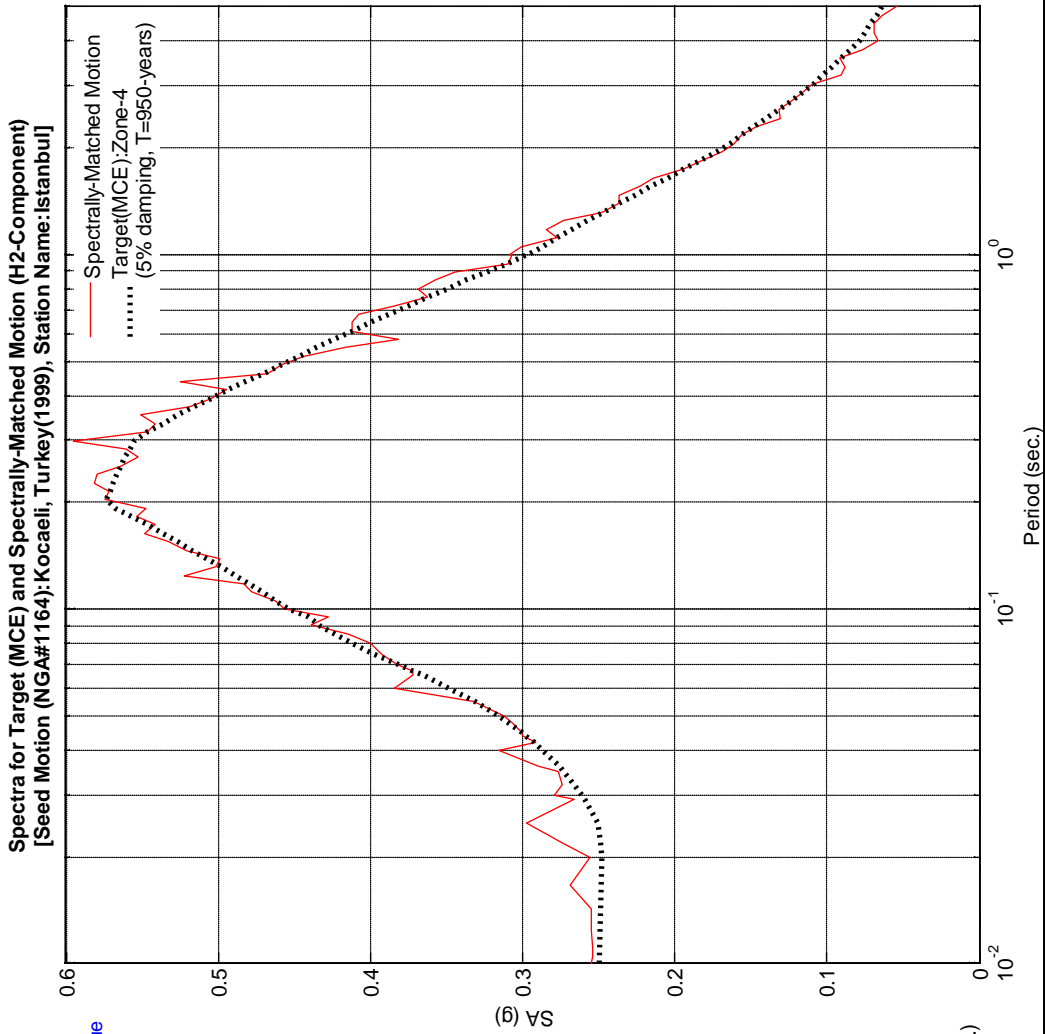


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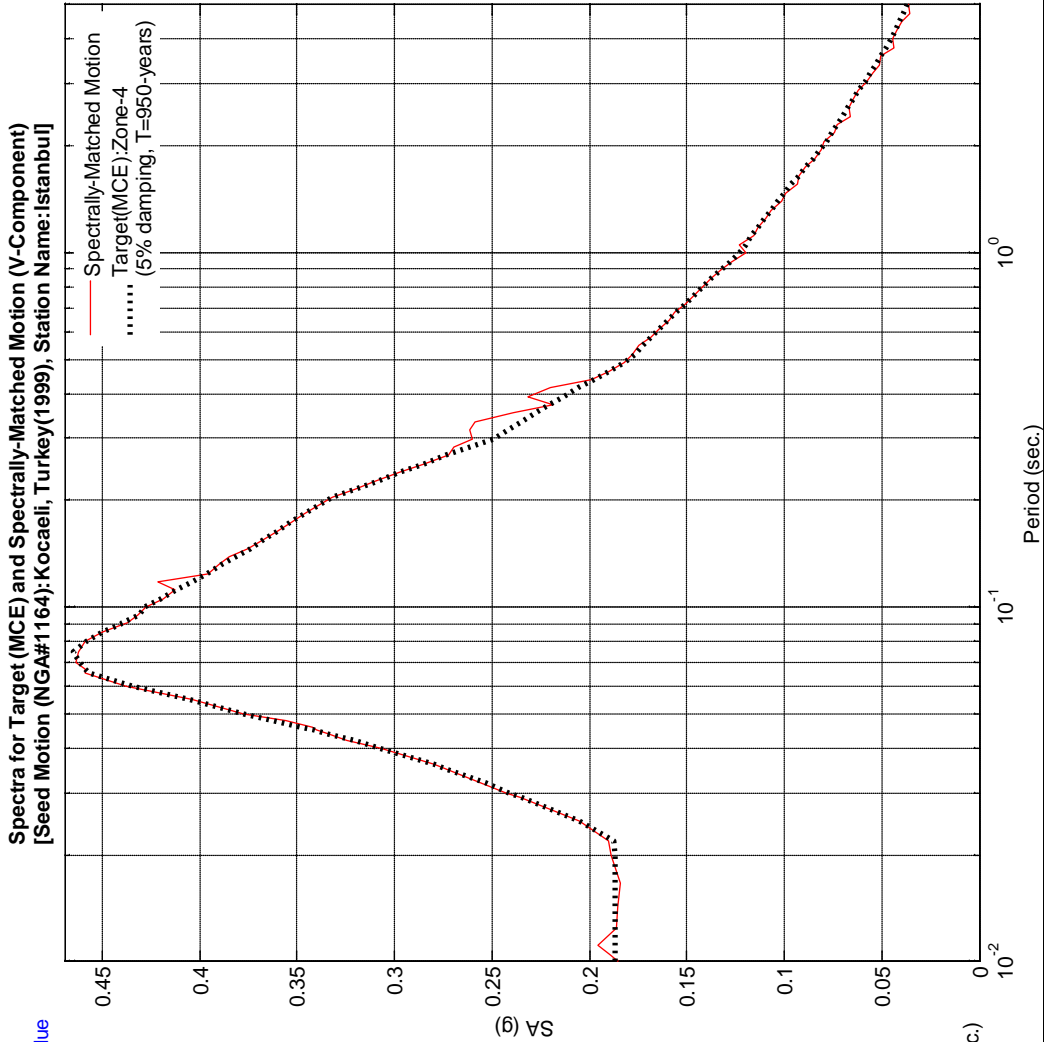




HSR 13-06 - EXECUTION VERSION



HSR 13-06 - EXECUTION VERSION



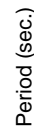
HSR 13-06 - EXECUTION VERSION

Table A.1: Ground Motion Metrics for Selected Seed and Spectrally-Matched Motions for Zone 5

Set	NGA #	Selected Seed Motions				Spectrally-Matched Motions							
		Earthquake Name	Year	Station Name	Mw	R	PGA H1 (g)	PGV H1 (cm/s)	PGD H1 (cm)	PGA H2 (g)	PGV H2 (cm/s)	PGD H2 (cm)	PGD V (cm)
1	882	Landers	1992	North Palm Springs	7.28	26.84	0.273	24.531	13.829	0.260	30.022	15.798	12.834
2	1776	Hector Mine	1999	Desert Hot Springs	7.13	56.4	0.273	29.672	20.721	0.271	33.232	19.614	13.208
3	2112	Denali, Alaska	2002	TAPS Pump Station #08	7.9	104.94	0.252	35.972	19.445	0.264	26.992	22.339	17.084
4	1637	Manjil, Iran	1990	Rudsar	7.37	64.47	0.276	27.712	11.133	0.269	30.295	11.821	12.190
5	169	Imperial Valley-06	1979	Delta	6.53	22.03	0.277	23.501	16.210	0.278	26.224	14.881	13.319
6	1208	Chi-Chi, Taiwan	1999	CHY046	7.62	24.11	0.255	29.695	17.955	0.273	30.844	21.420	18.042
7	1164	Kocaeli, Turkey	1999	Istanbul	7.51	51.95	0.283	37.998	60.281	0.266	51.255	38.097	25.382
													34.983

<div>SC SOLUTIONS</div>	<div>PROJ. NO: BY: QC CHECK: QA CHECK: DATE:</div> <div>J. Zhong M. Perez V. Jacob 09/07/2012</div>	<div>SELECTED SEED AND SPECTRALLY-MATCHED MOTIONS</div>	<div>PLATE</div> <div>A5-0</div>
		<div>MCE – ZONE 5</div> <div>CALIFORNIA HIGH SPEED TRAIN PROJECT FRESNO TO BAKERSFIELD, CALIFORNIA</div>	



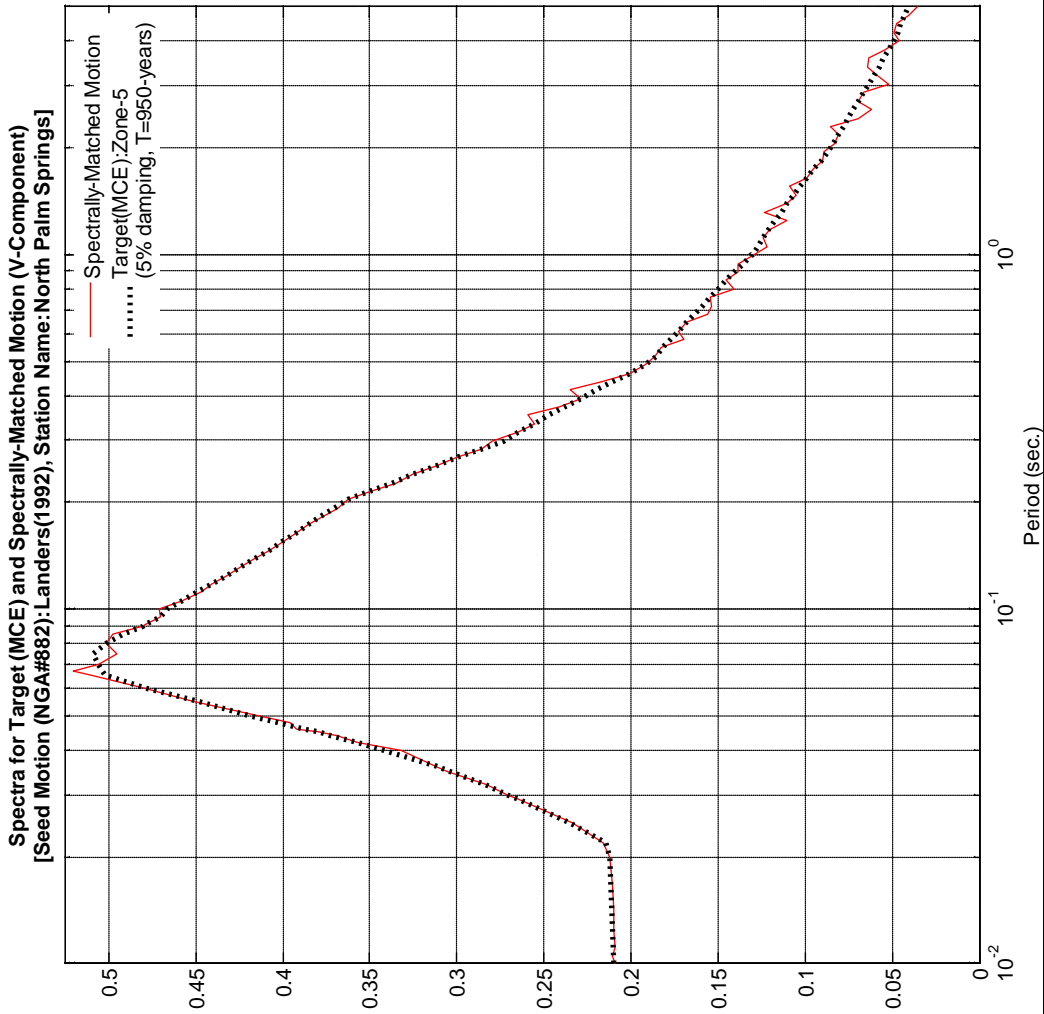


PLATE

CALIFORNIA HIGH SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD, CALIFORNIA

SC SOLUTIONS

A5-2

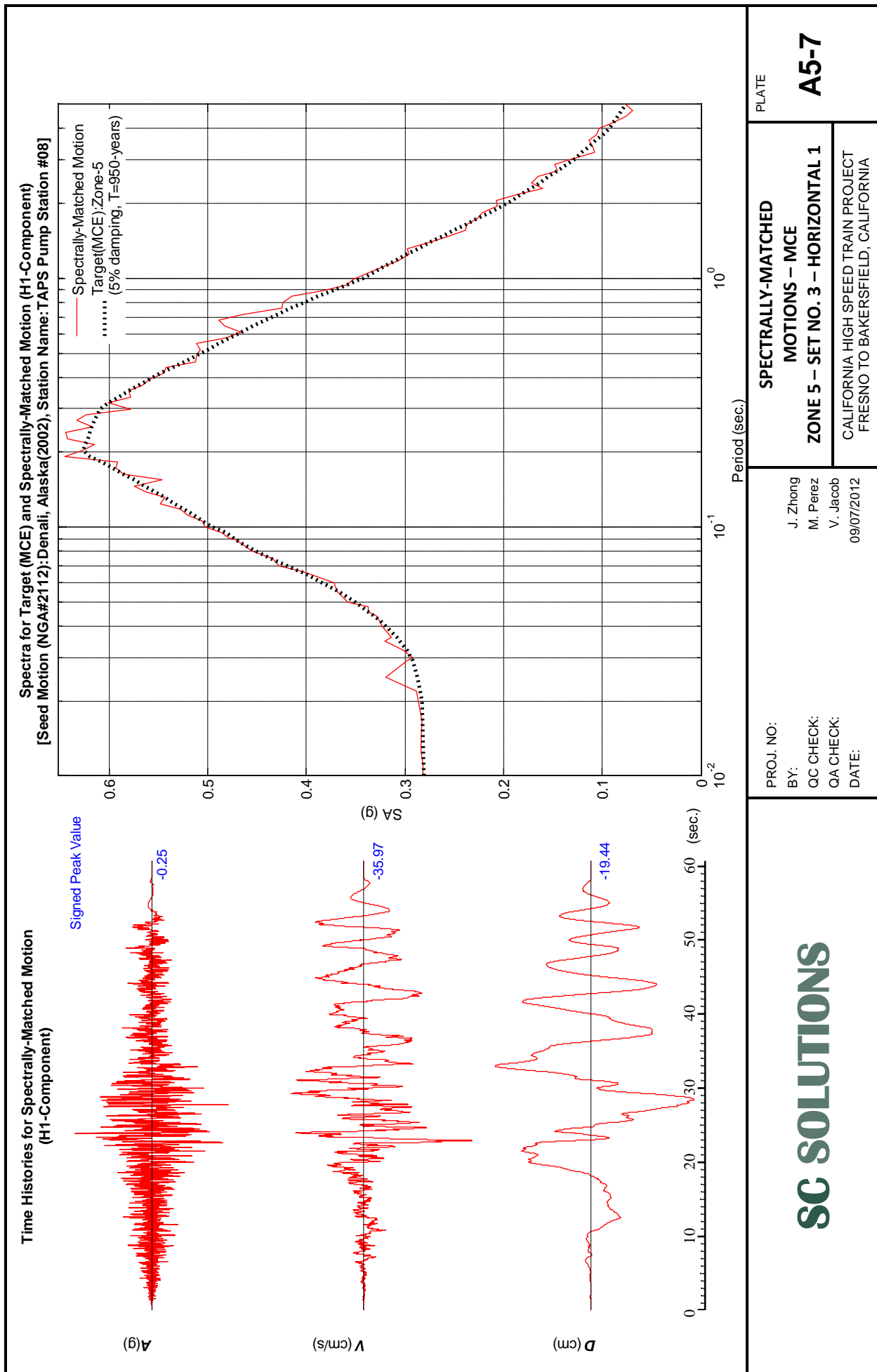


HSR 13-06 - EXECUTION VERSION





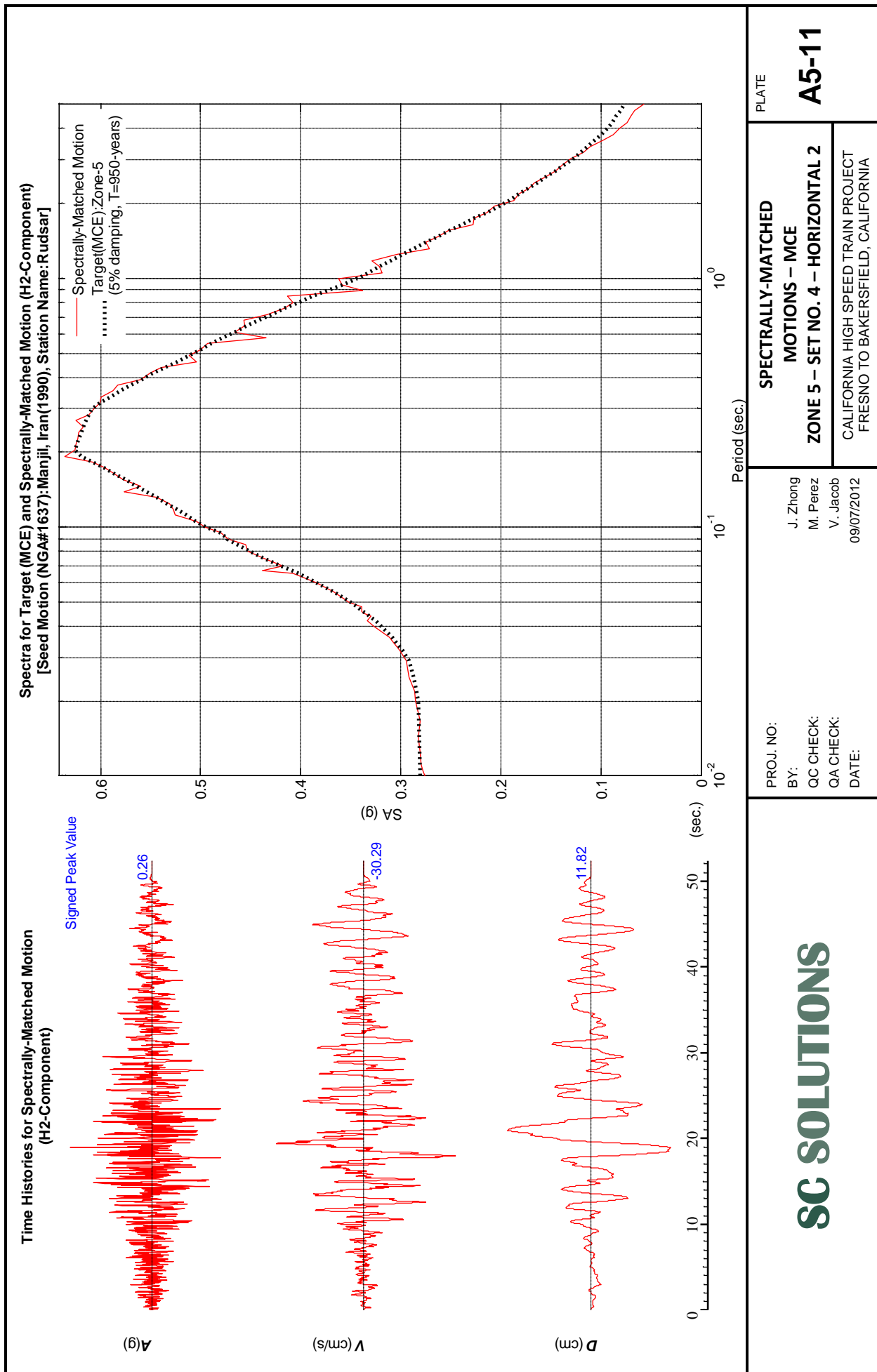


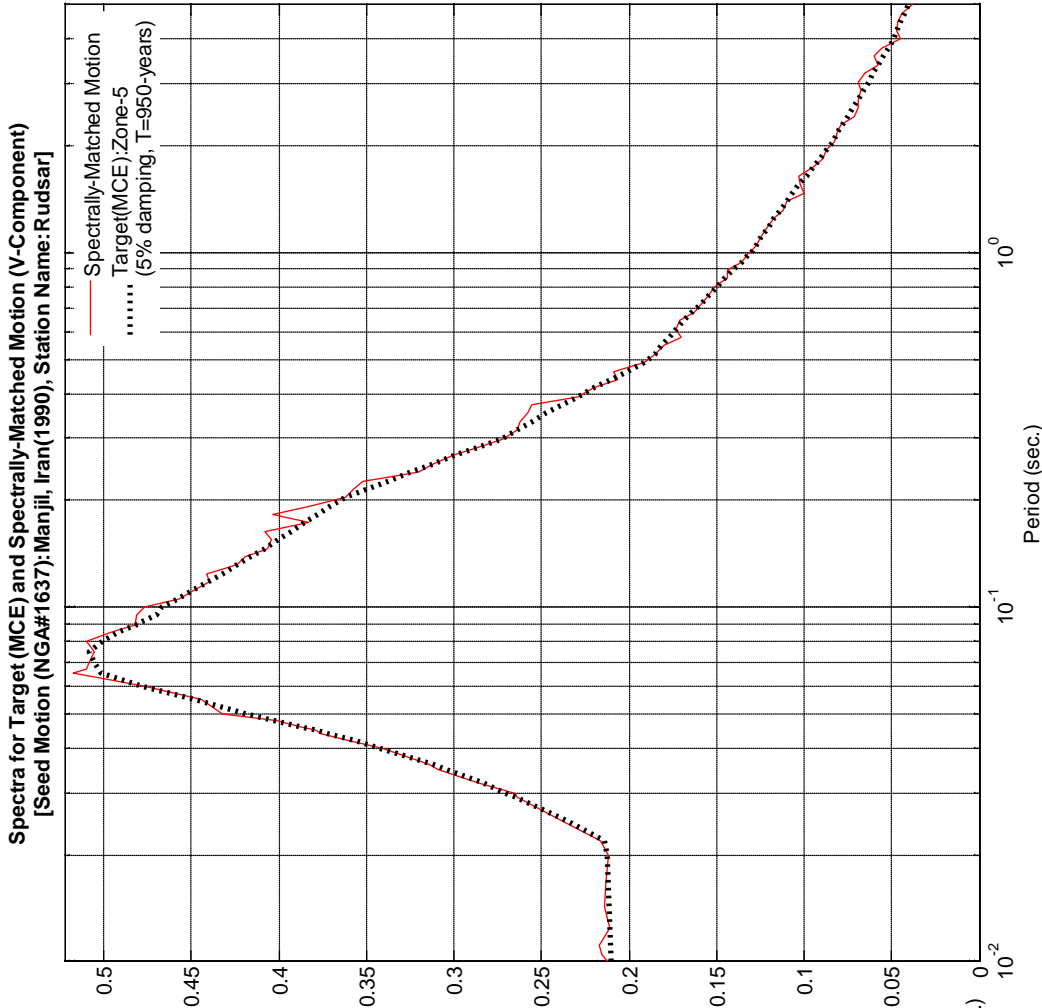












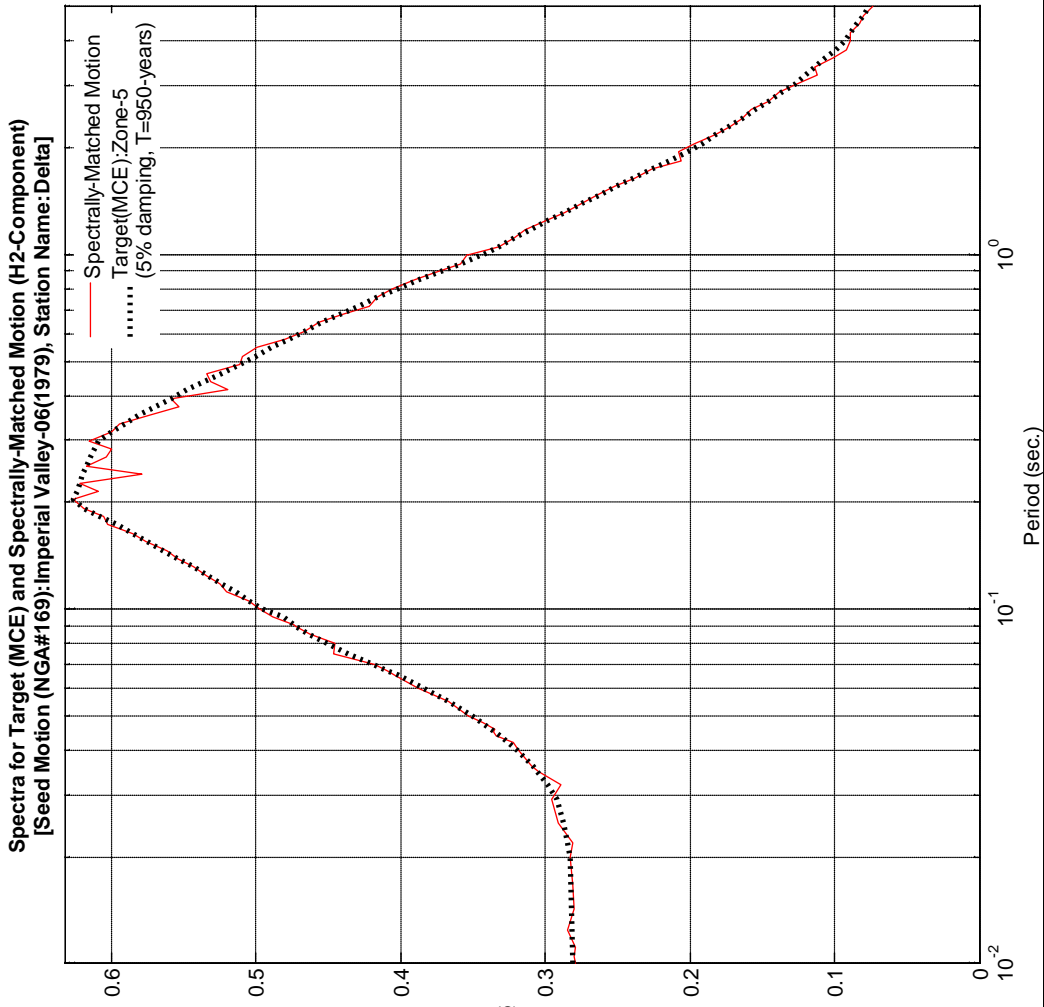
**SPECTRALLY-MATCHED
MOTIONS – MCE
ZONE 5 – SET NO. 4 – VERTICAL**

SC SOLUTIONS

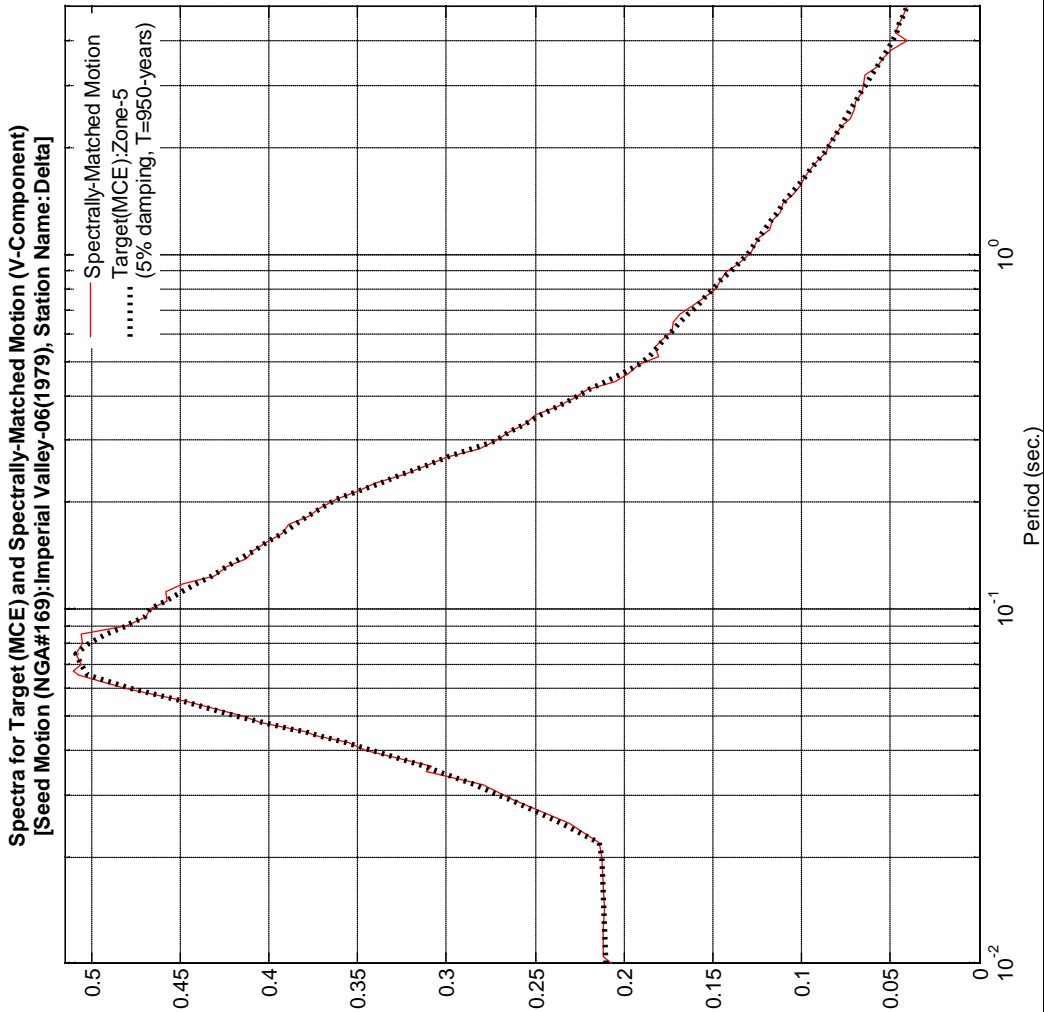
A5-12

CALIFORNIA HIGH SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD, CALIFORNIA





<div>SC SOLUTIONS</div>		PROJ. NO: BY: QC CHECK: QA CHECK: DATE:		J. Zhong M. Perez V. Jacob 09/07/2012		<div>SPECTRALLY-MATCHED MOTIONS – MCE ZONE 5 – SET NO. 5 – HORIZONTAL 2</div> <div>CALIFORNIA HIGH SPEED TRAIN PROJECT FRESNO TO BAKERSFIELD, CALIFORNIA</div>		PLATE <div>A5-14</div>
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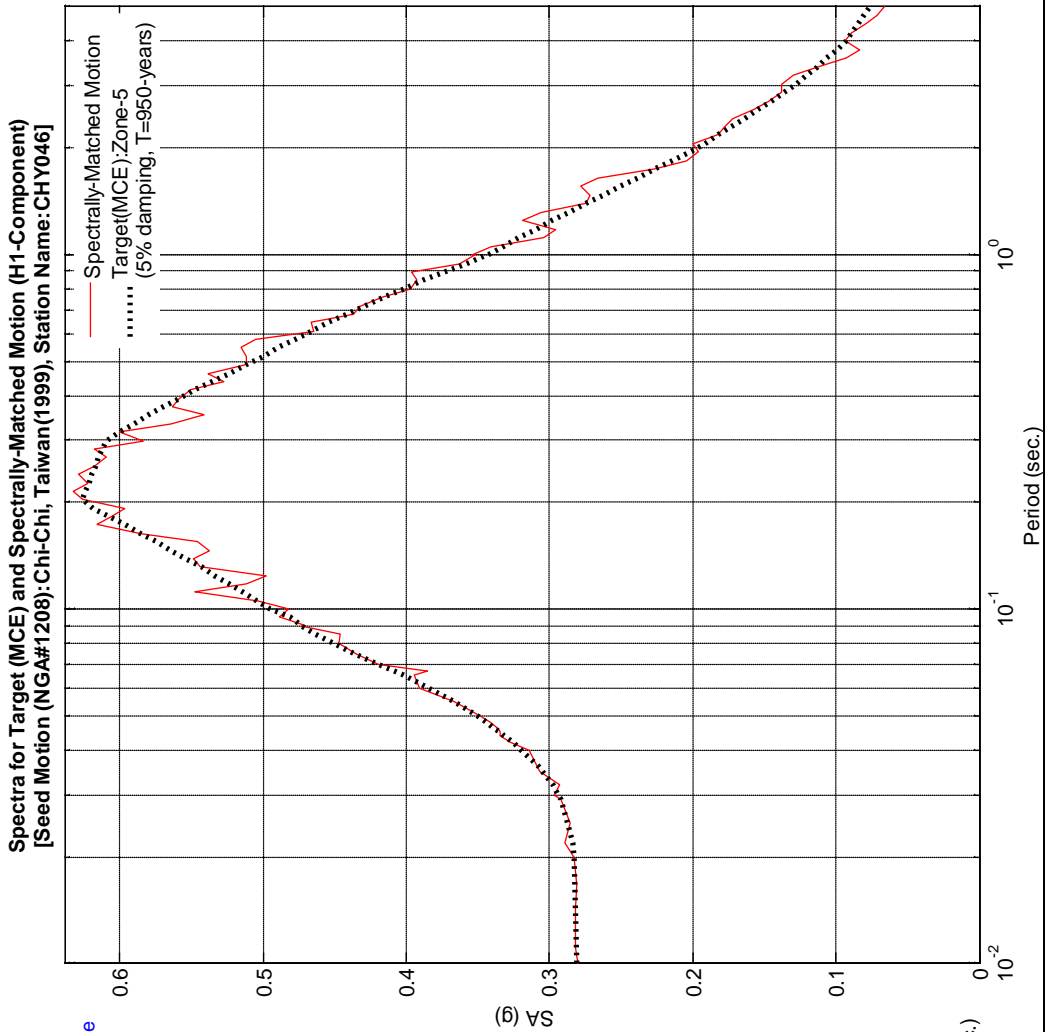


**SPECTRALLY-MATCHED
MOTIONS – MCE
ZONE 5 – SET NO. 5 – VERTICAL**

SC SOLUTIONS

A5-15

CALIFORNIA HIGH SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD, CALIFORNIA



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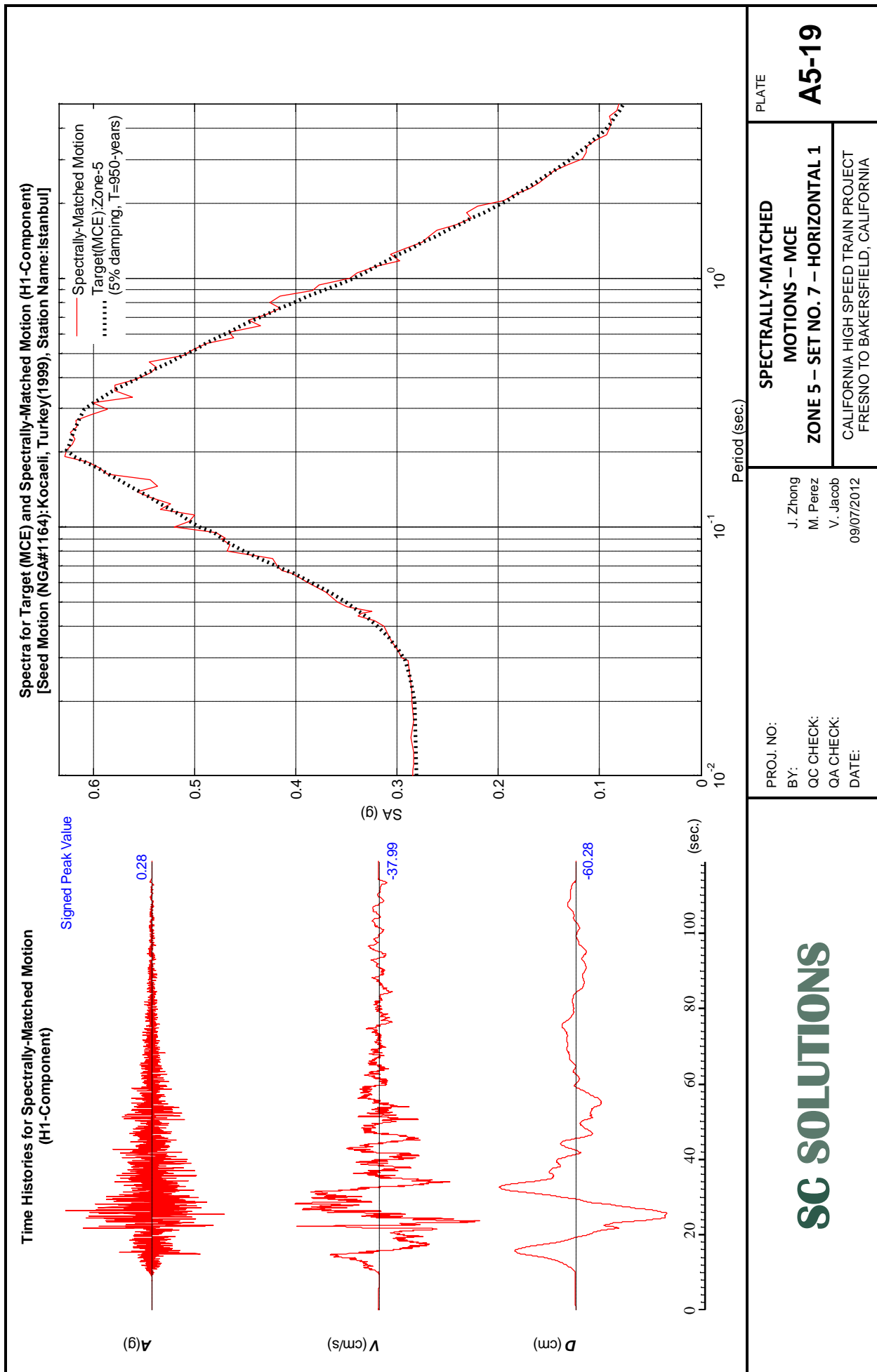
A5-16

ZONE 5 – SET NO. 6 – HORIZONTAL 1

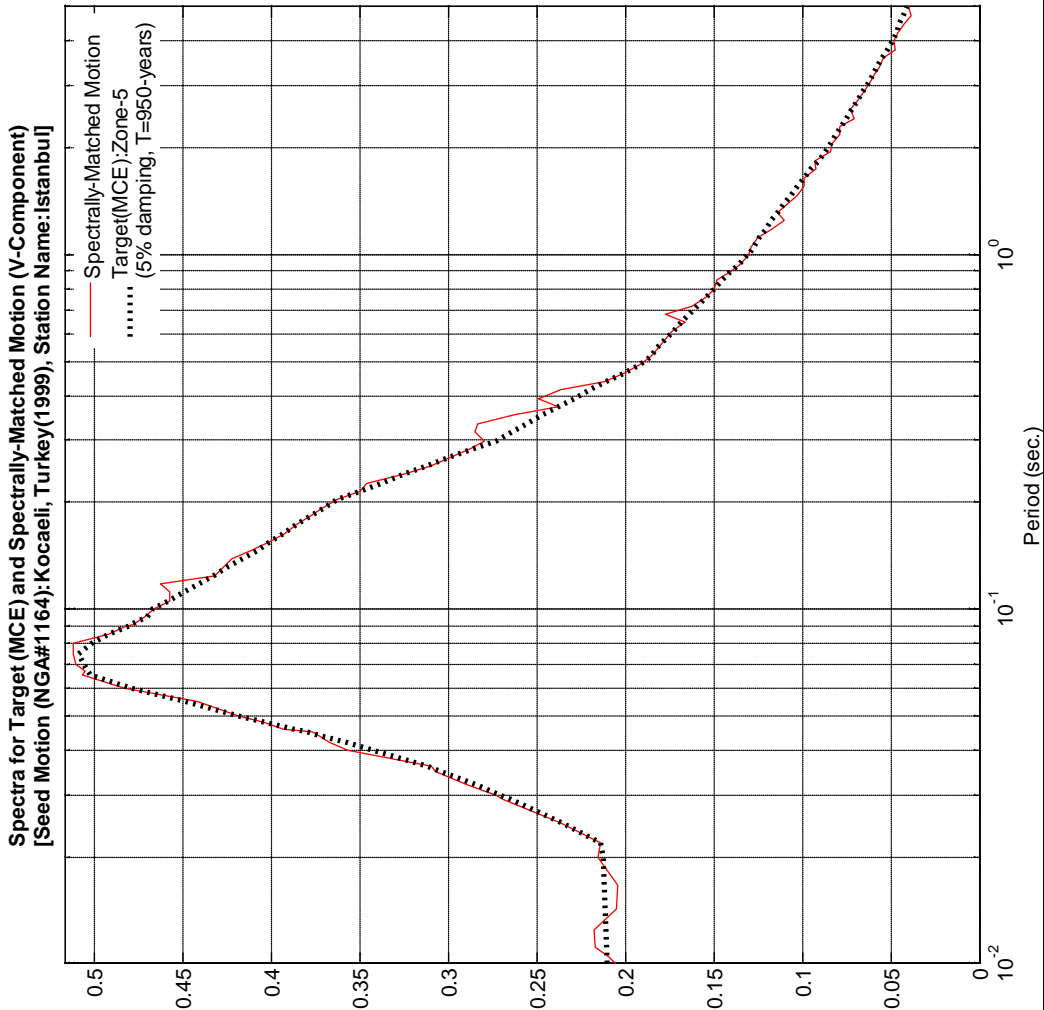
CALIFORNIA HIGH SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD, CALIFORNIA











HSR 13-06 - EXECUTION VERSION

Table A.1: Ground Motion Metrics for Selected Seed and Spectrally-Matched Motions for Zone 6

Set	NGA #	Selected Seed Motions				Spectrally-Matched Motions							
		Earthquake Name	Year	Station Name	Mw	R	PGA H1 (g)	PGV H1 (cm/s)	PGD H1 (cm)	PGA H2 (g)	PGV H2 (cm/s)	PGD H2 (cm)	PGD V (cm)
1	882	Landers	1992	North Palm Springs	7.28	26.84	0.327	29.623	16.239	0.311	33.136	18.187	8.849
2	1776	Hector Mine	1999	Desert Hot Springs	7.13	56.4	0.331	39.168	26.745	0.329	40.137	24.016	10.291
3	2112	Denali, Alaska	2002	TAPS Pump Station #08	7.9	104.94	0.305	40.769	22.886	0.320	37.078	27.391	19.646
4	1637	Manjil, Iran	1990	Rudсар	7.37	64.47	0.332	35.211	12.856	0.320	34.865	14.718	9.430
5	169	Imperial Valley-06	1979	Delta	6.53	22.03	0.328	29.682	18.565	0.330	30.901	17.229	10.249
6	1208	Chi-Chi, Taiwan	1999	CHY046	7.62	24.11	0.307	41.718	21.720	0.326	35.806	25.129	17.875
7	1164	Kocaeli, Turkey	1999	Istanbul	7.51	51.95	0.330	41.759	72.211	0.339	59.867	44.918	41.714

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**SELECTED SEED AND
SPECTRALLY-MATCHED MOTIONS**
MCE – ZONE 6

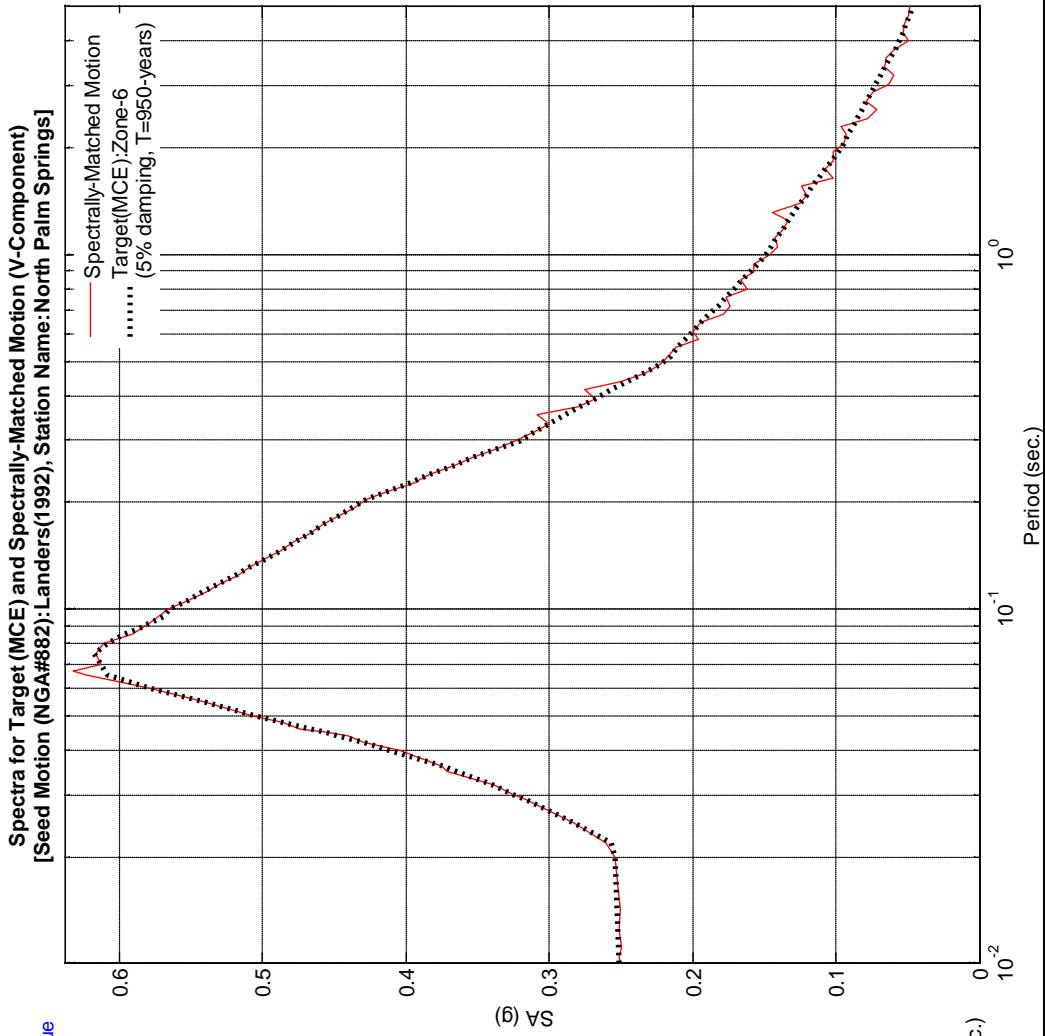
CALIFORNIA HIGH SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD, CALIFORNIA

PLATE

A6-0

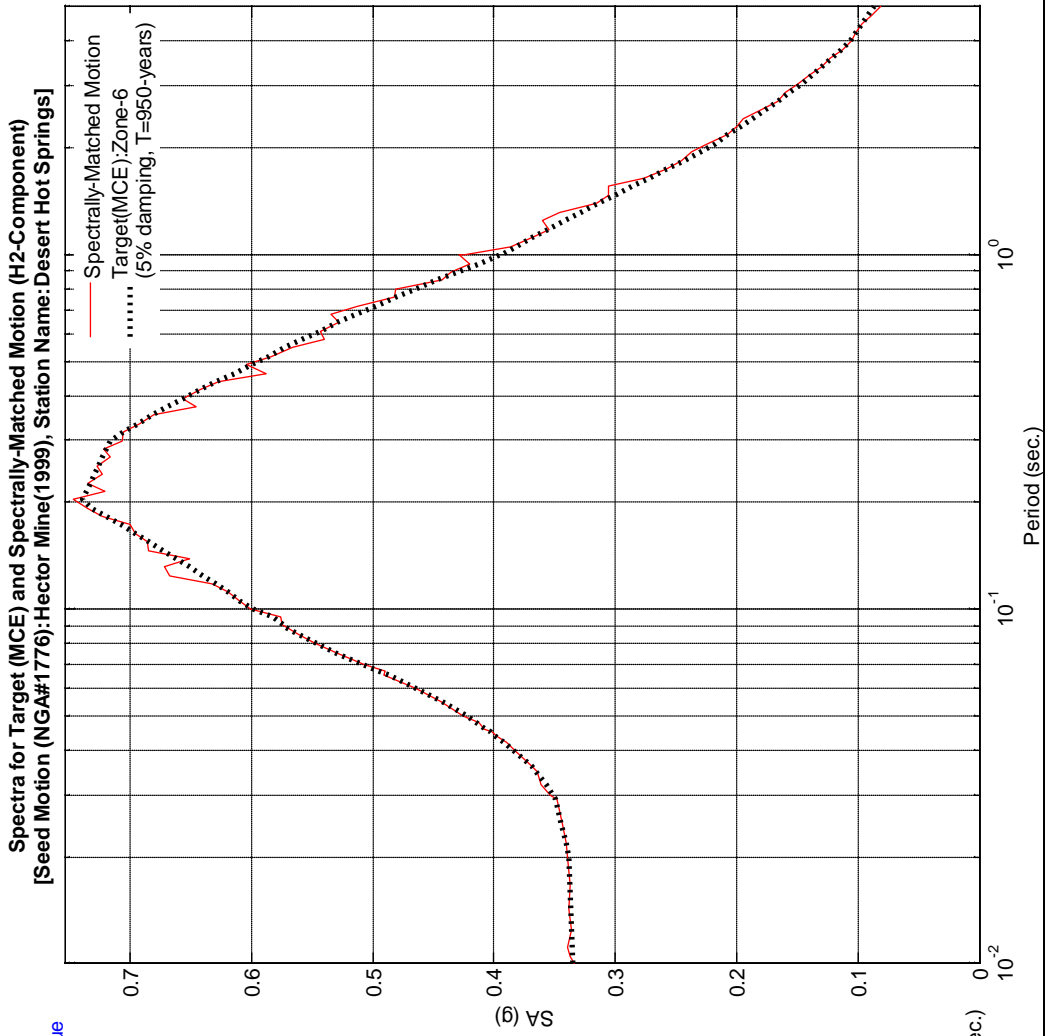






HSR 13-06 - EXECUTION VERSION



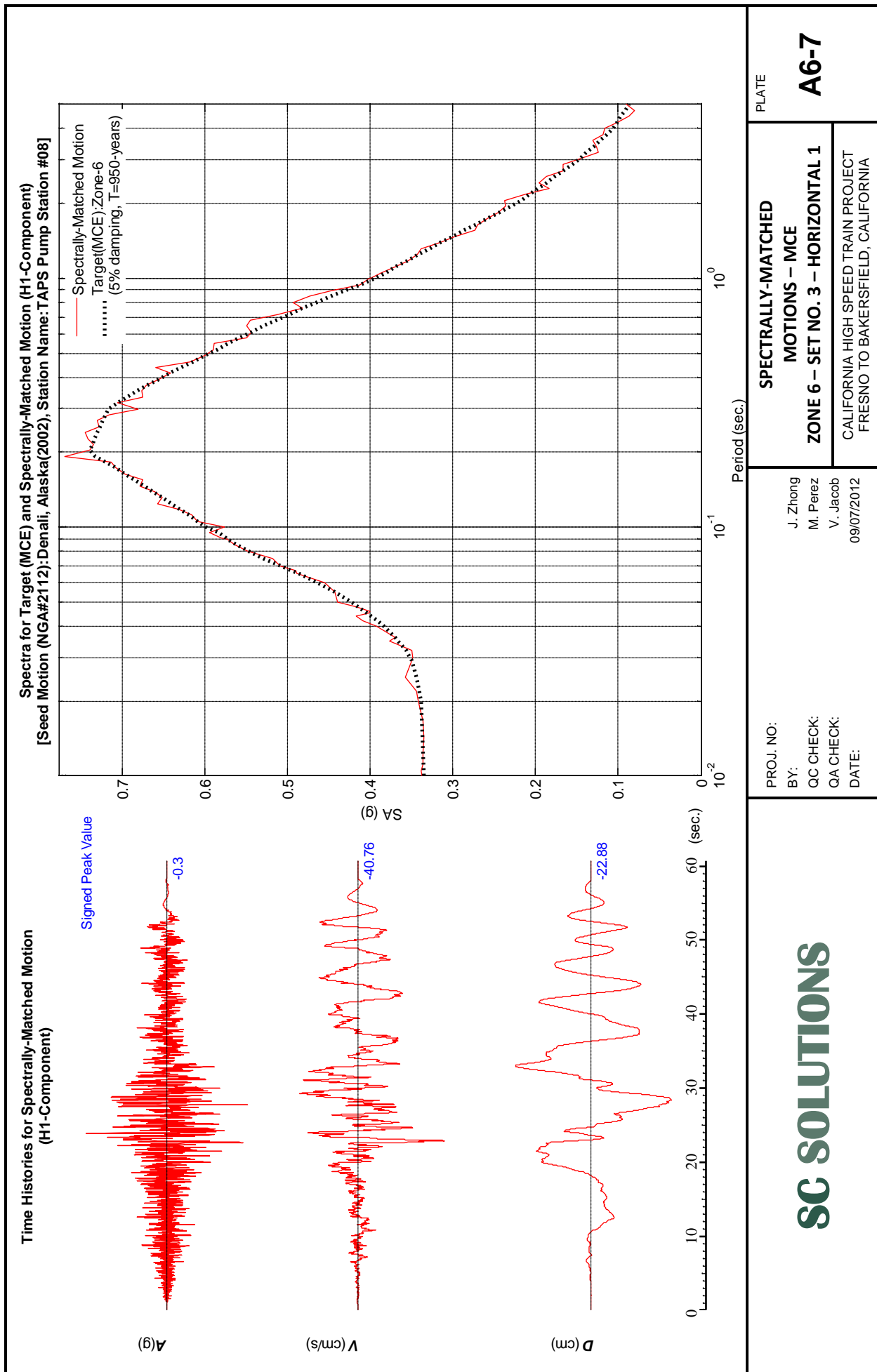


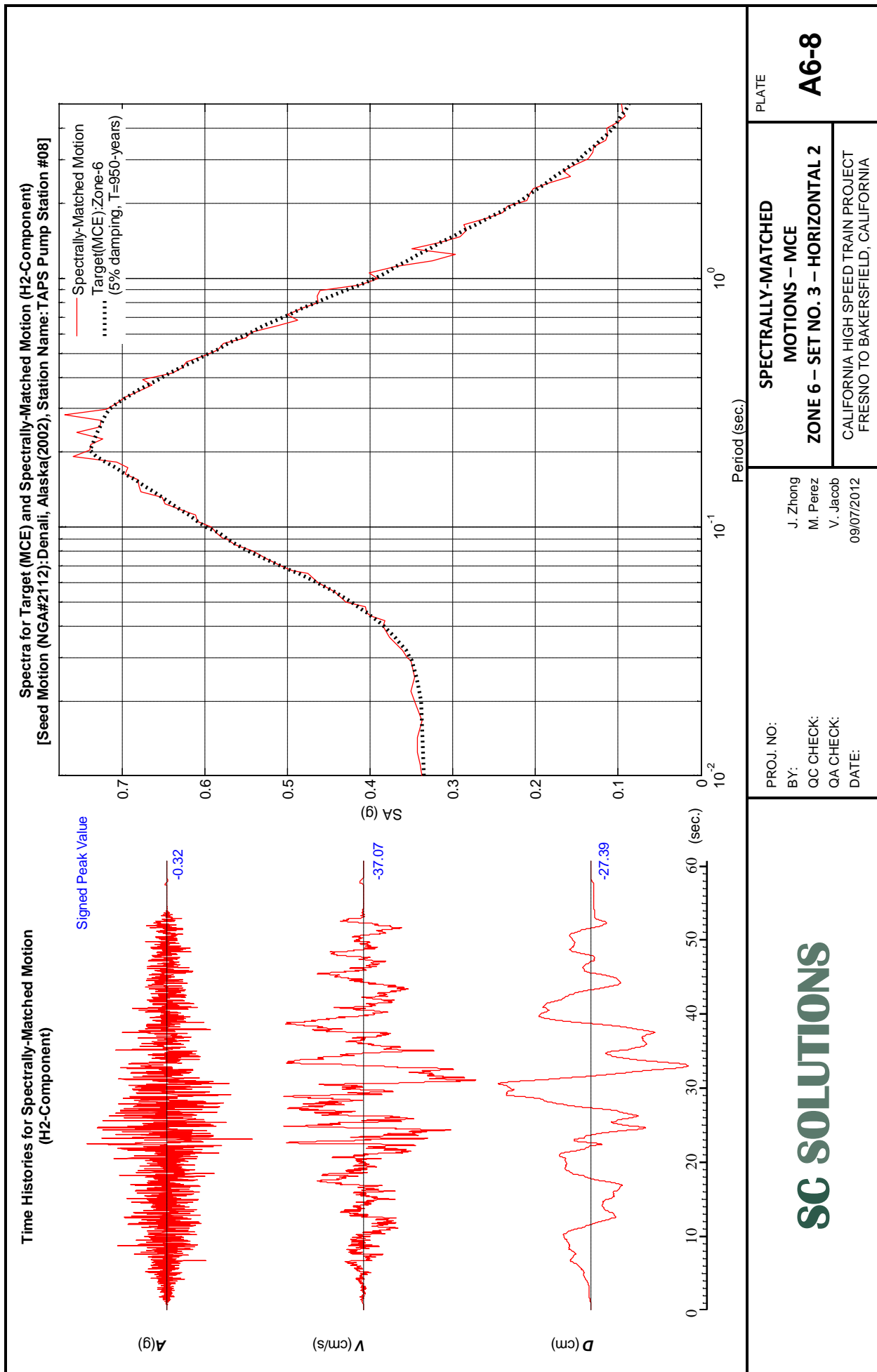
HSR 13-06 - EXECUTION VERSION



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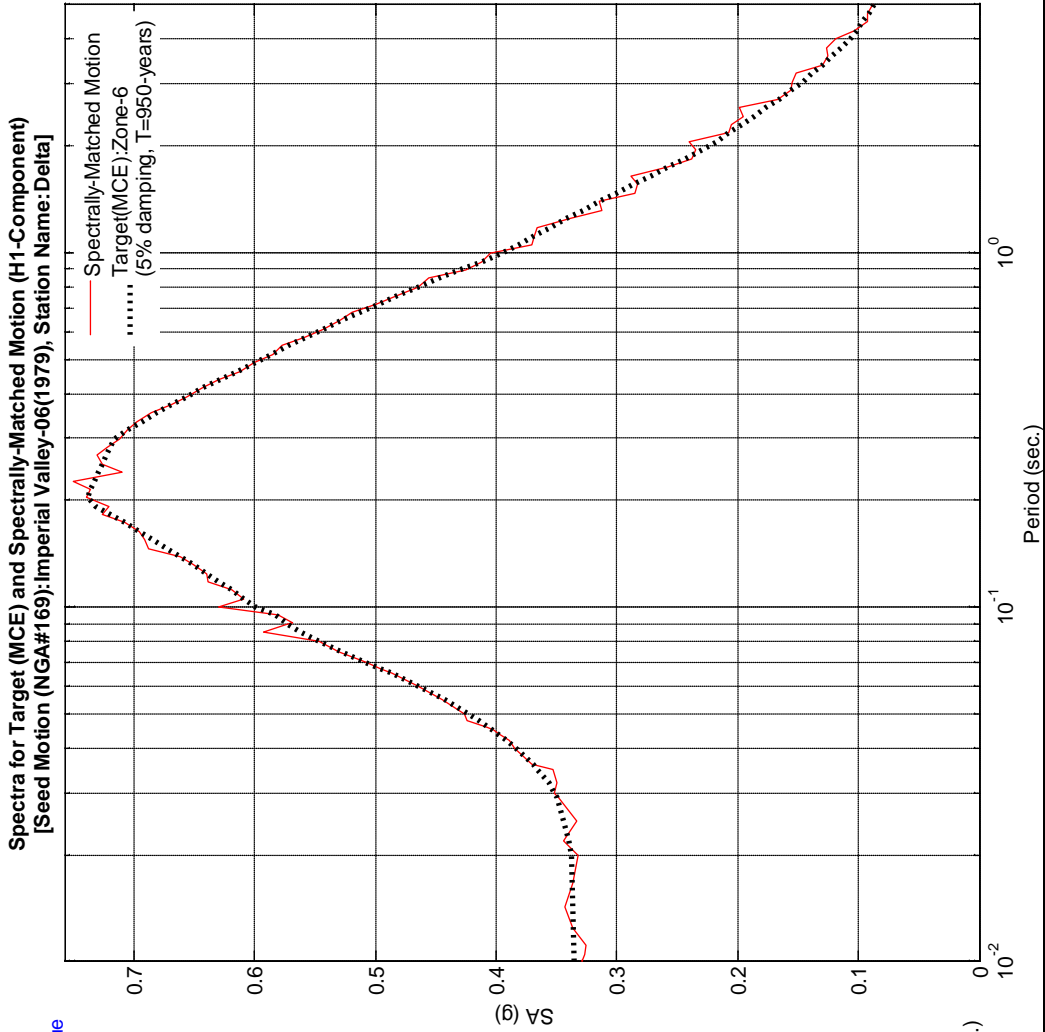
SC SOLUTIONS

A6-9

CALIFORNIA HIGH SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD, CALIFORNIA







SC SOLUTIONS

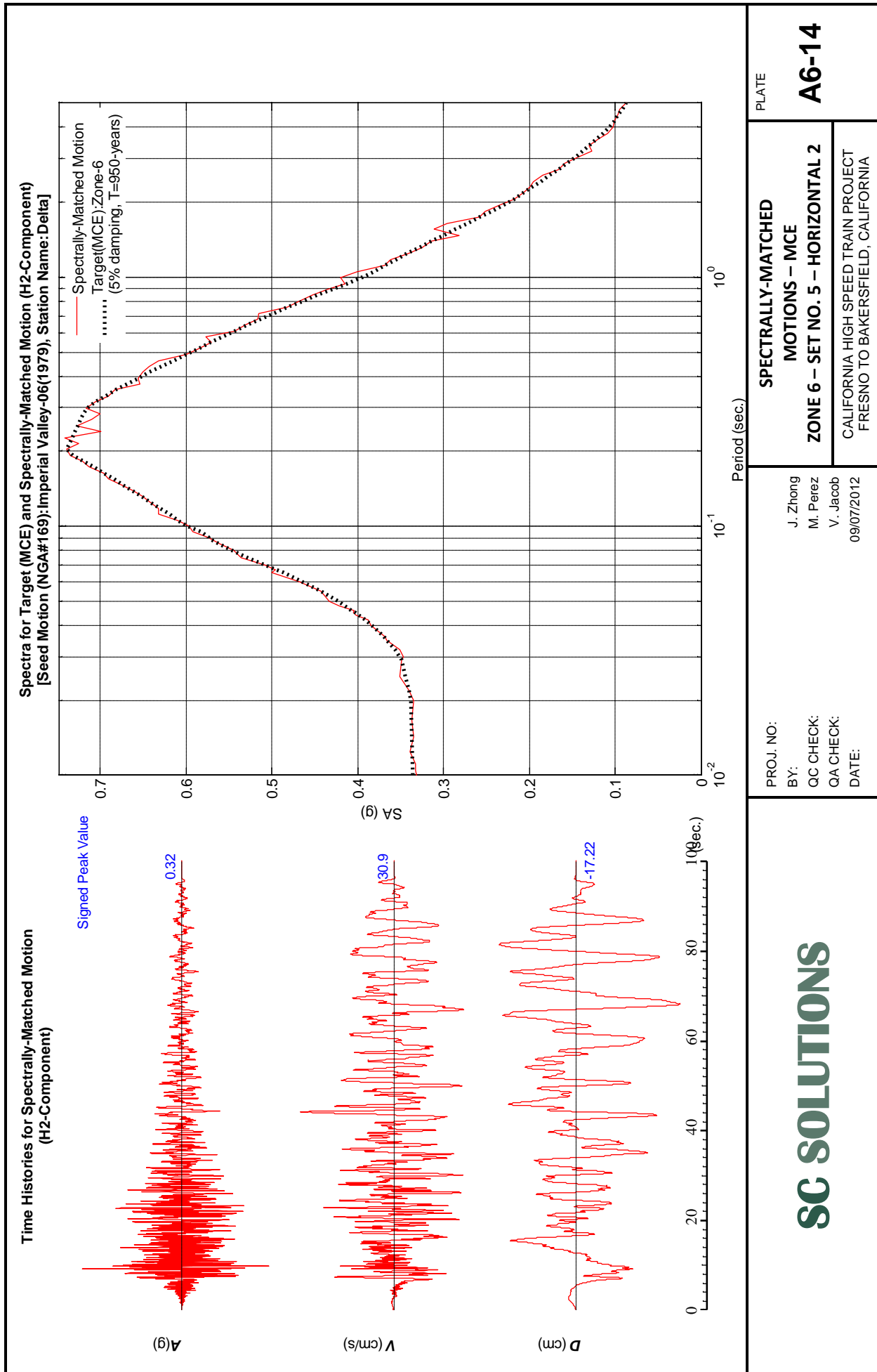
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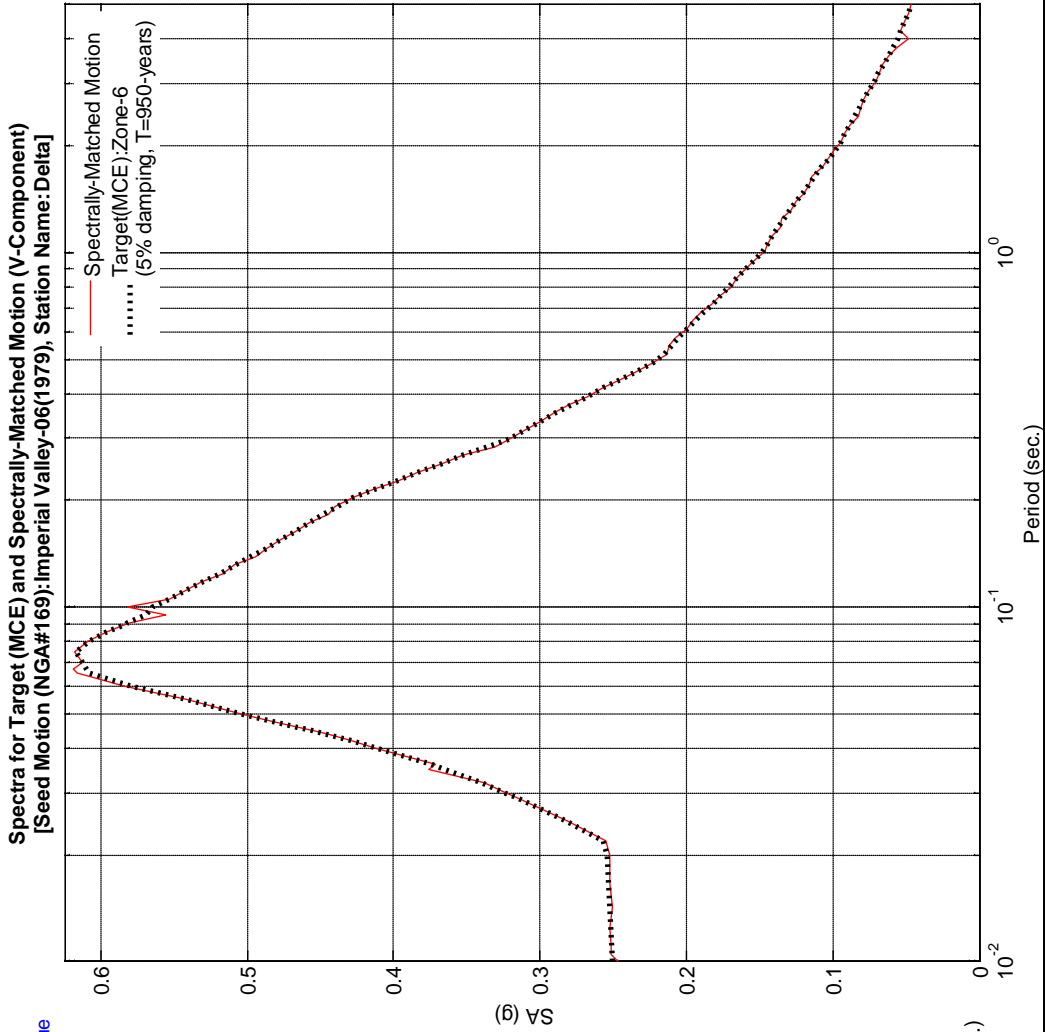
ZONE 6 – SET NO. 5 – HORIZONTAL 1

**CALIFORNIA HIGH SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD, CALIFORNIA**

PLATE

A6-13





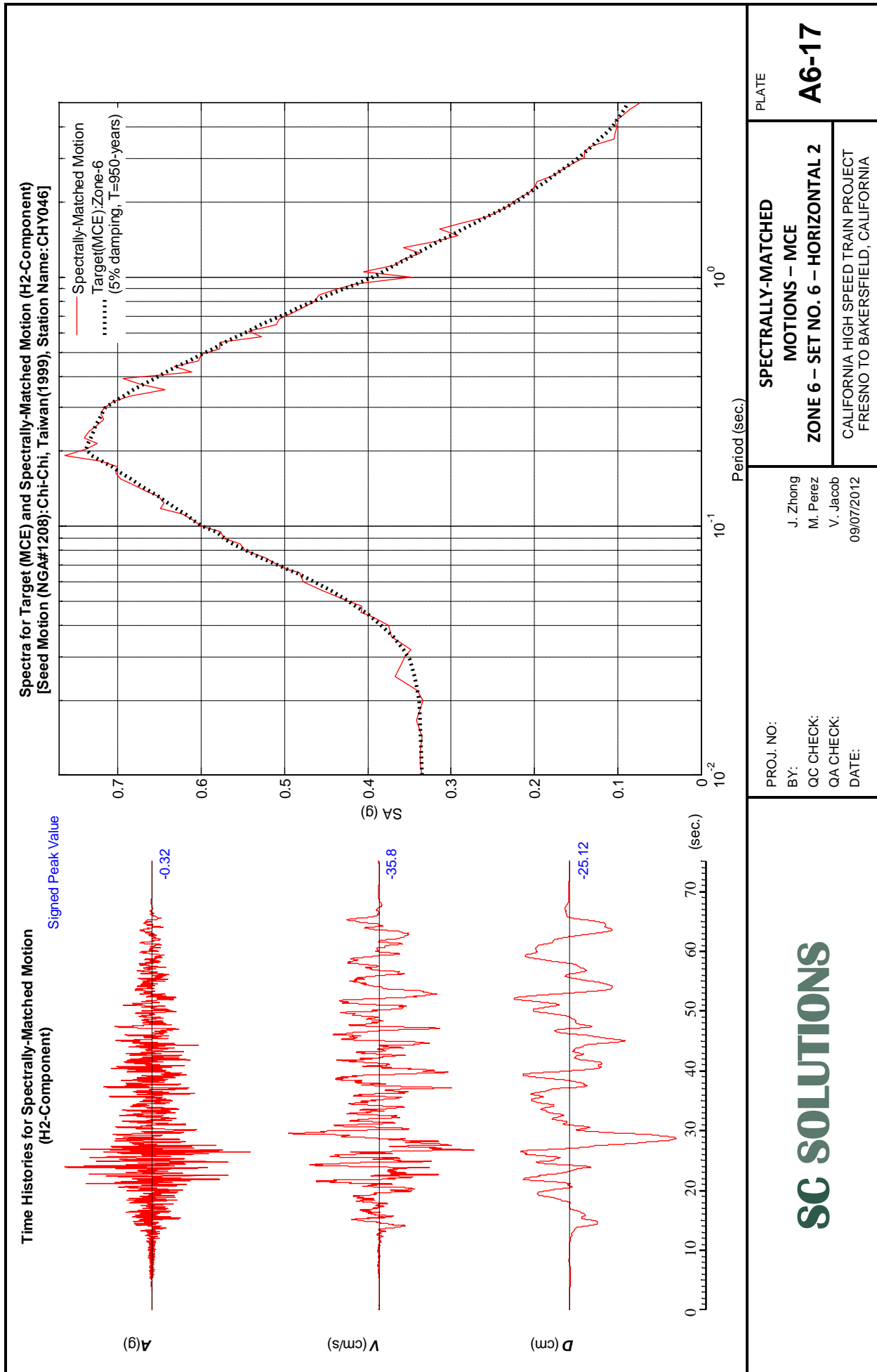
SC SOLUTIONS

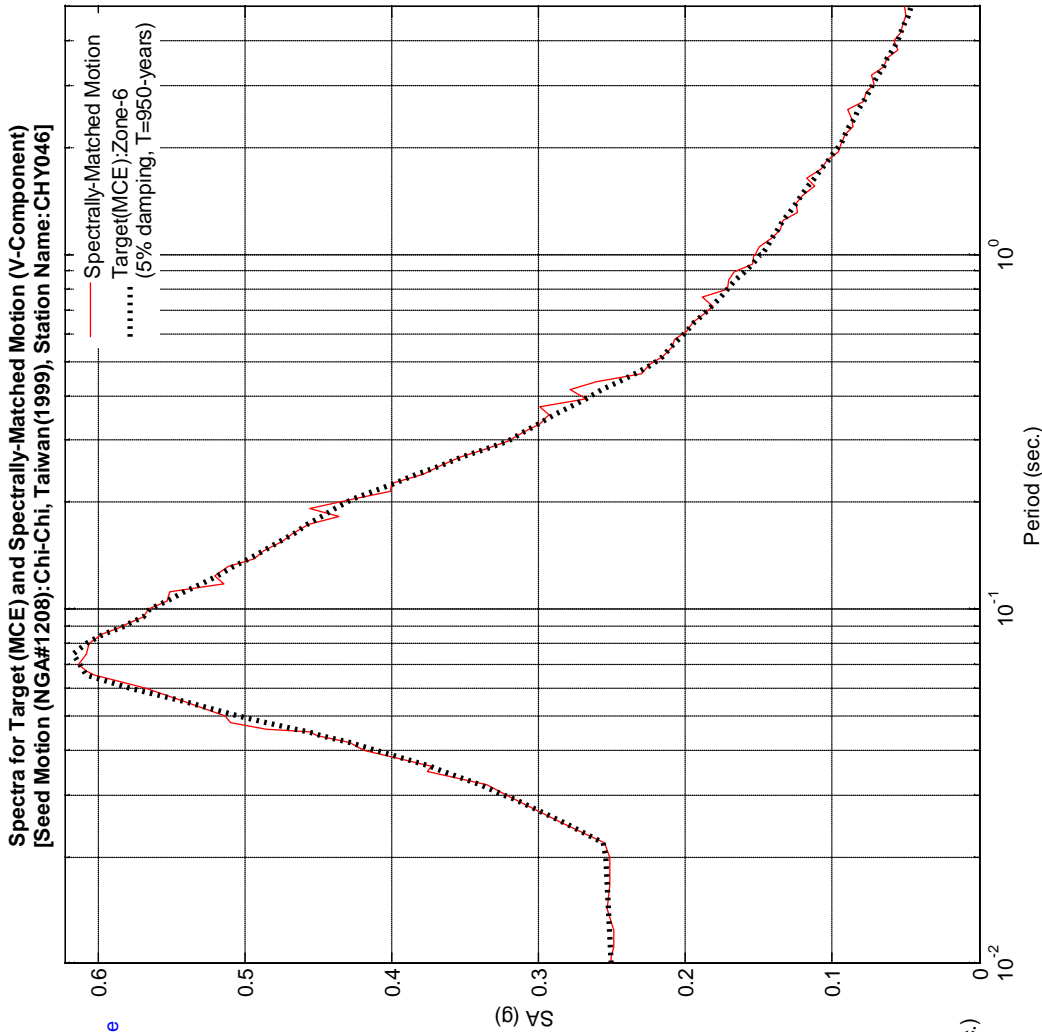
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**SPECTRALLY-MATCHED
MOTIONS – MCE
ZONE 6 – SET NO. 5 – VERTICAL**

PLATE
A6-15



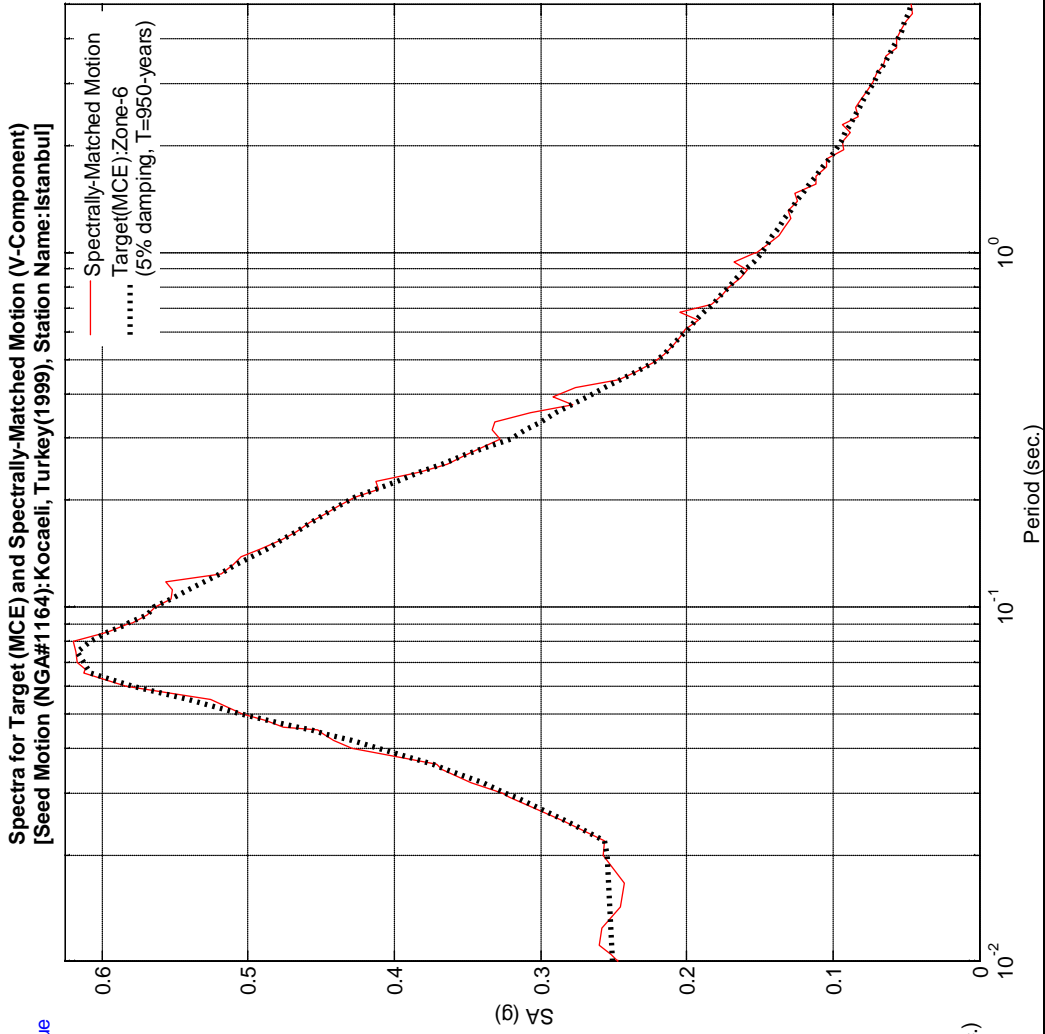




<div>SC SOLUTIONS</div>		PROJ. NO: BY: J. Zhong QC CHECK: M. Perez QA CHECK: V. Jacob DATE: 09/07/2012		<div>SPECTRALLY-MATCHED MOTIONS – MCE ZONE 6 – SET NO. 6 – VERTICAL</div> <div>CALIFORNIA HIGH SPEED TRAIN PROJECT FRESNO TO BAKERSFIELD, CALIFORNIA</div>		PLATE <div>A6-18</div>
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<div>SC SOLUTIONS</div>		PROJ. NO: BY: QC CHECK: QA CHECK: DATE:		J. Zhong M. Perez V. Jacob 09/07/2012		<div>SPECTRALLY-MATCHED MOTIONS – MCE ZONE 6 – SET NO. 7 – VERTICAL</div> <div>CALIFORNIA HIGH SPEED TRAIN PROJECT FRESNO TO BAKERSFIELD, CALIFORNIA</div>		PLATE A6-21
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Table A.1: Ground Motion Metrics for Selected Seed and Spectrally-Matched Motions for Zone 7

Set	NGA #	Selected Seed Motions				Spectrally-Matched Motions							
		Earthquake Name	Year	Station Name	Mw	R	PGA H1 (g)	PGV H1 (cm/s)	PGD H1 (cm)	PGA H2 (g)	PGV H2 (cm/s)	PGD H2 (cm)	PGD V (cm)
1	882	Landers	1992	North Palm Springs	7.28	26.84	0.354	30.782	16.948	0.342	34.901	19.742	9.338
2	1776	Hector Mine	1999	Desert Hot Springs	7.13	56.4	0.363	37.735	26.725	0.357	41.501	24.058	10.929
3	2112	Denali, Alaska	2002	TAPS Pump Station #08	7.9	104.94	0.345	43.628	24.595	0.347	35.867	31.230	21.032
4	1637	Manjil, Iran	1990	Rudsar	7.37	64.47	0.361	35.953	12.358	0.350	36.575	14.794	10.347
5	169	Imperial Valley-06	1979	Delta	6.53	22.03	0.356	31.136	20.328	0.360	32.386	18.177	10.691
6	1208	Chi-Chi, Taiwan	1999	CHY046	7.62	24.11	0.339	40.482	26.206	0.349	37.091	26.145	18.883
7	1164	Kocaeli, Turkey	1999	Istanbul	7.51	51.95	0.378	54.498	83.179	0.352	64.483	48.875	45.421

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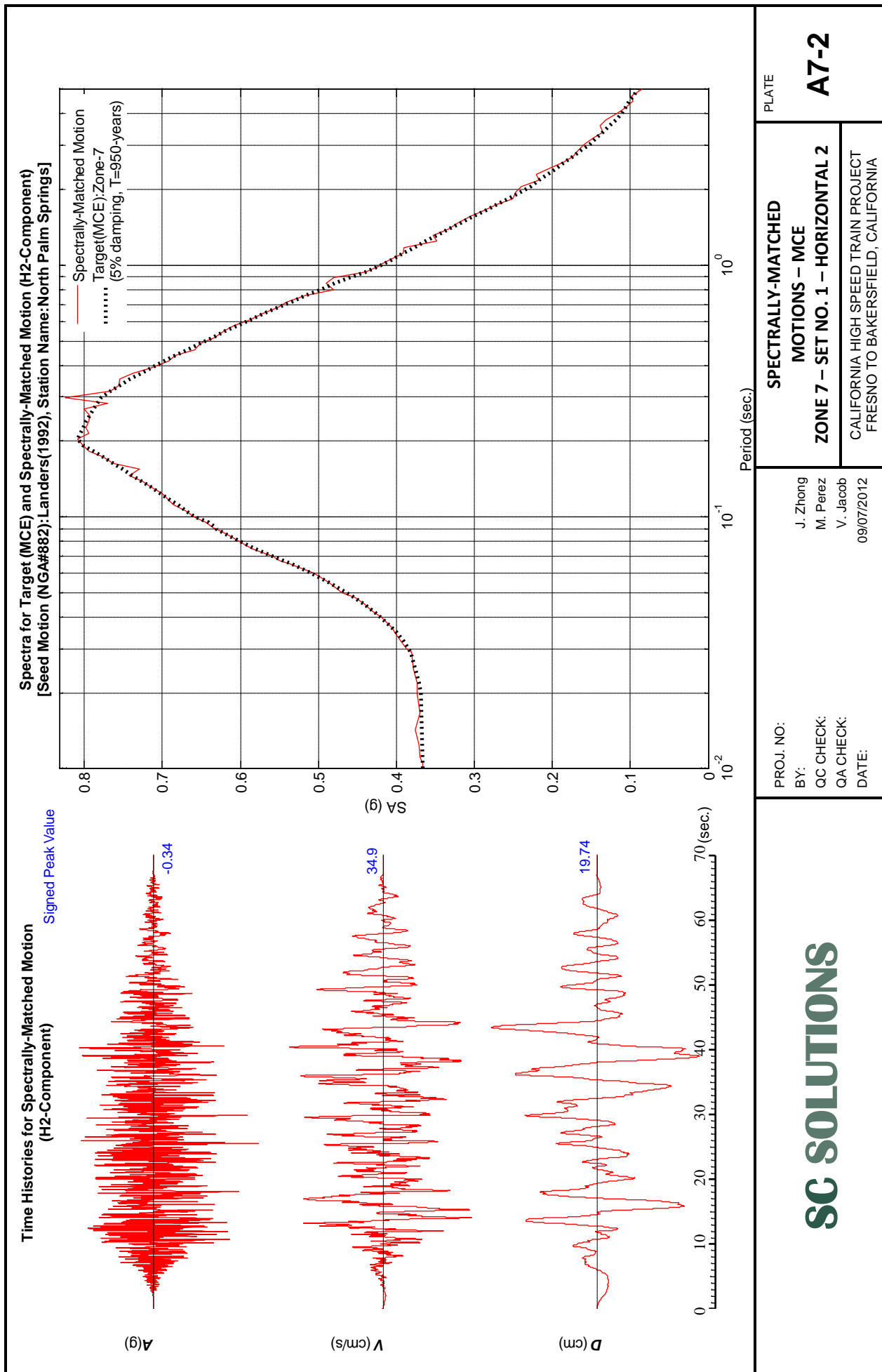
**SELECTED SEED AND
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MCE – ZONE 7

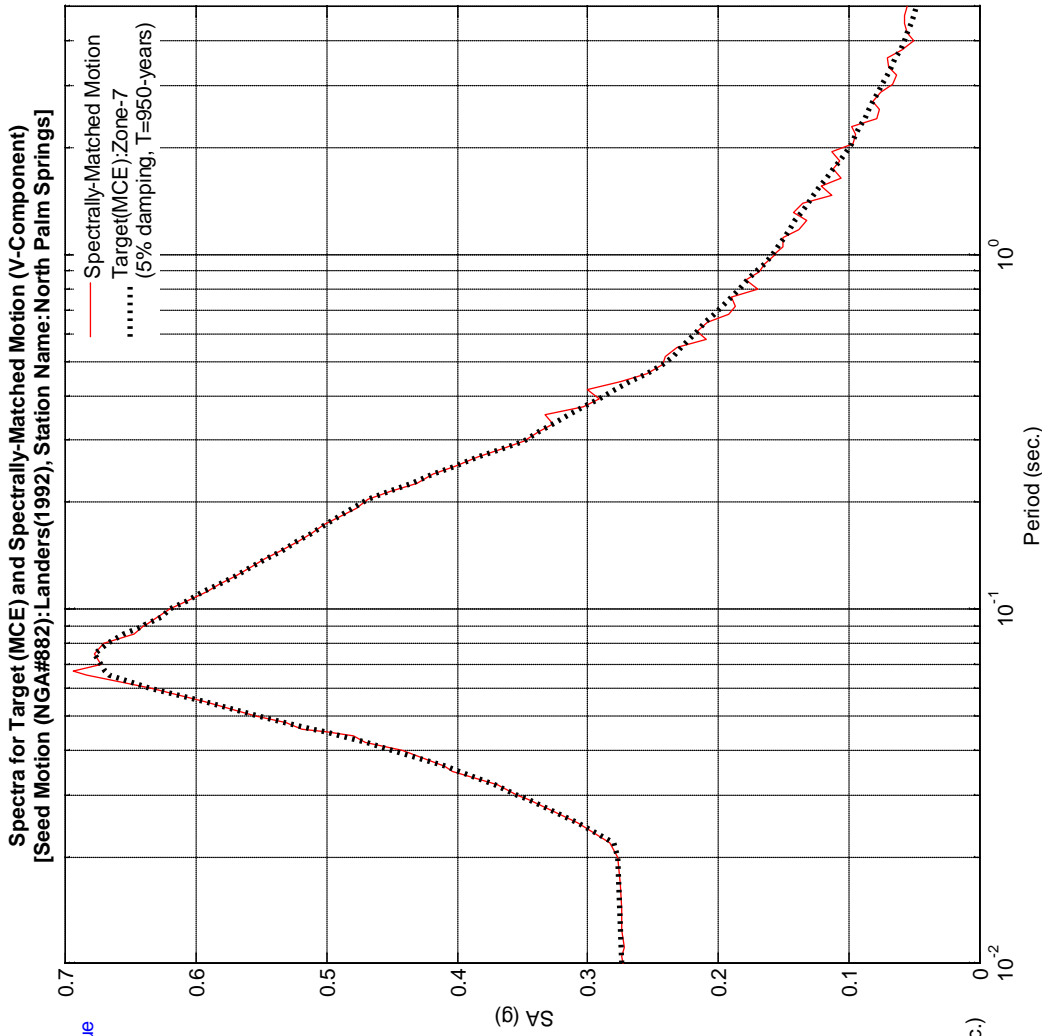
CALIFORNIA HIGH SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD, CALIFORNIA

PLATE

A7-0







<div>SC SOLUTIONS</div>	<div>PROJ. NO: BY: QC CHECK: QA CHECK: DATE:</div>	<div>J. Zhong M. Perez V. Jacob 09/07/2012</div>	<div>1. Grid (Sec.)</div>		<div>PLATE A7-3</div>
			<div>SPECTRALLY-MATCHED MOTIONS – MCE ZONE 7 – SET NO. 1 – VERTICAL</div>	<div>CALIFORNIA HIGH SPEED TRAIN PROJECT FRESNO TO BAKERSFIELD, CALIFORNIA</div>	











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**SPECTRALLY-MATCHED
MOTIONS – MCE**

ZONE 7 – SET NO. 3 – HORIZONTAL 2

CALIFORNIA HIGH SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD, CALIFORNIA



**SPECTRALLY-MATCHED
MOTIONS – MCE**

PLATE

SC SOLUTIONS

MOTIONS – MICE
ZONE 7 – SET NO. 3 – VERTICAL

CALIFORNIA HIGH SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD, CALIFORNIA

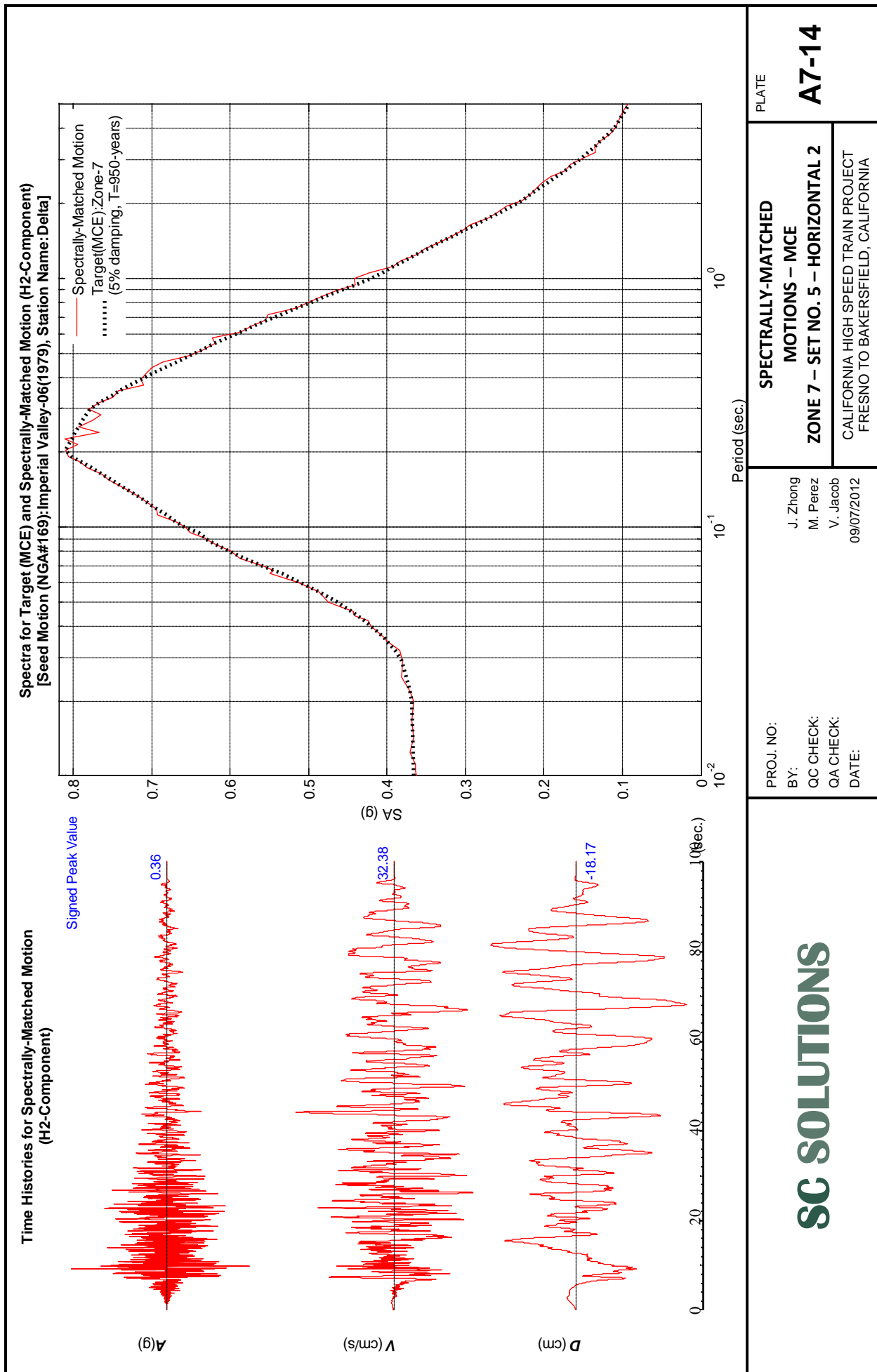
A7-9



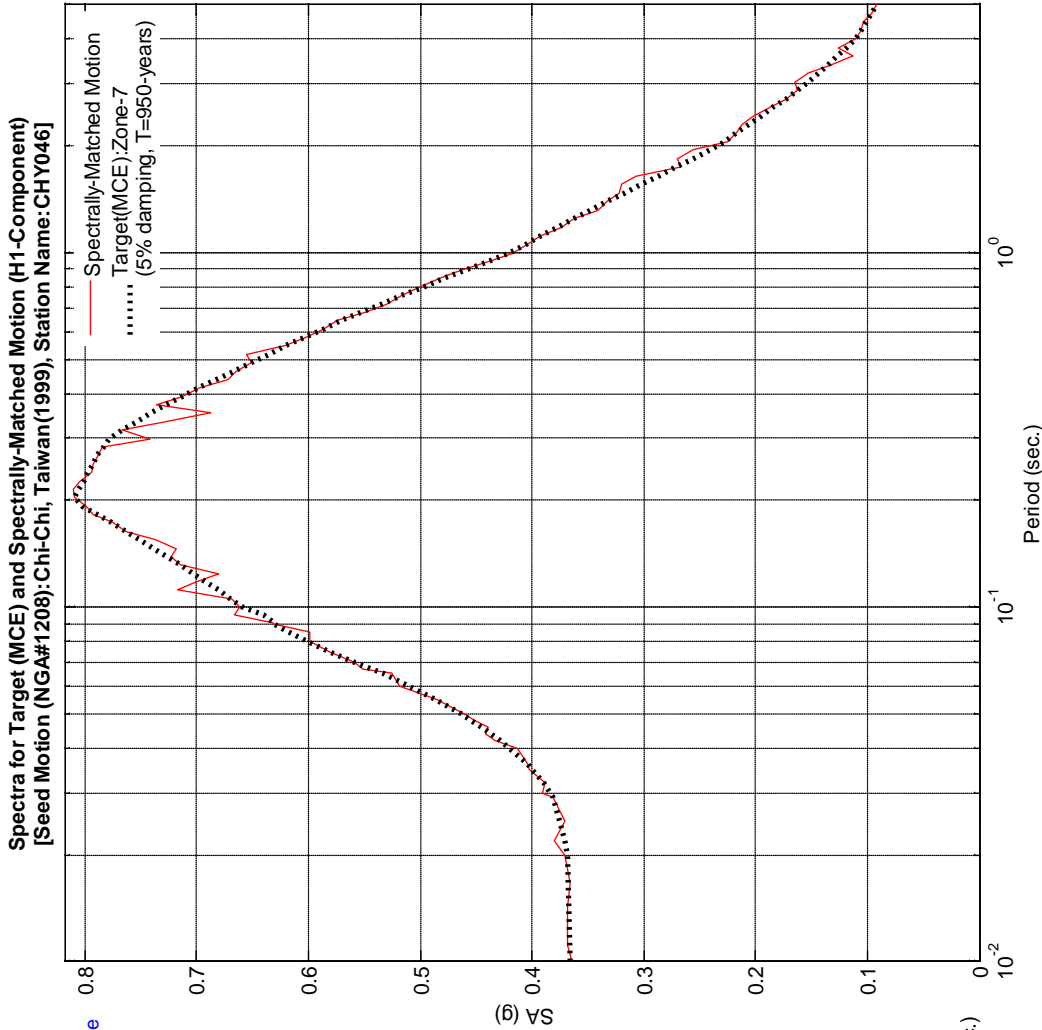












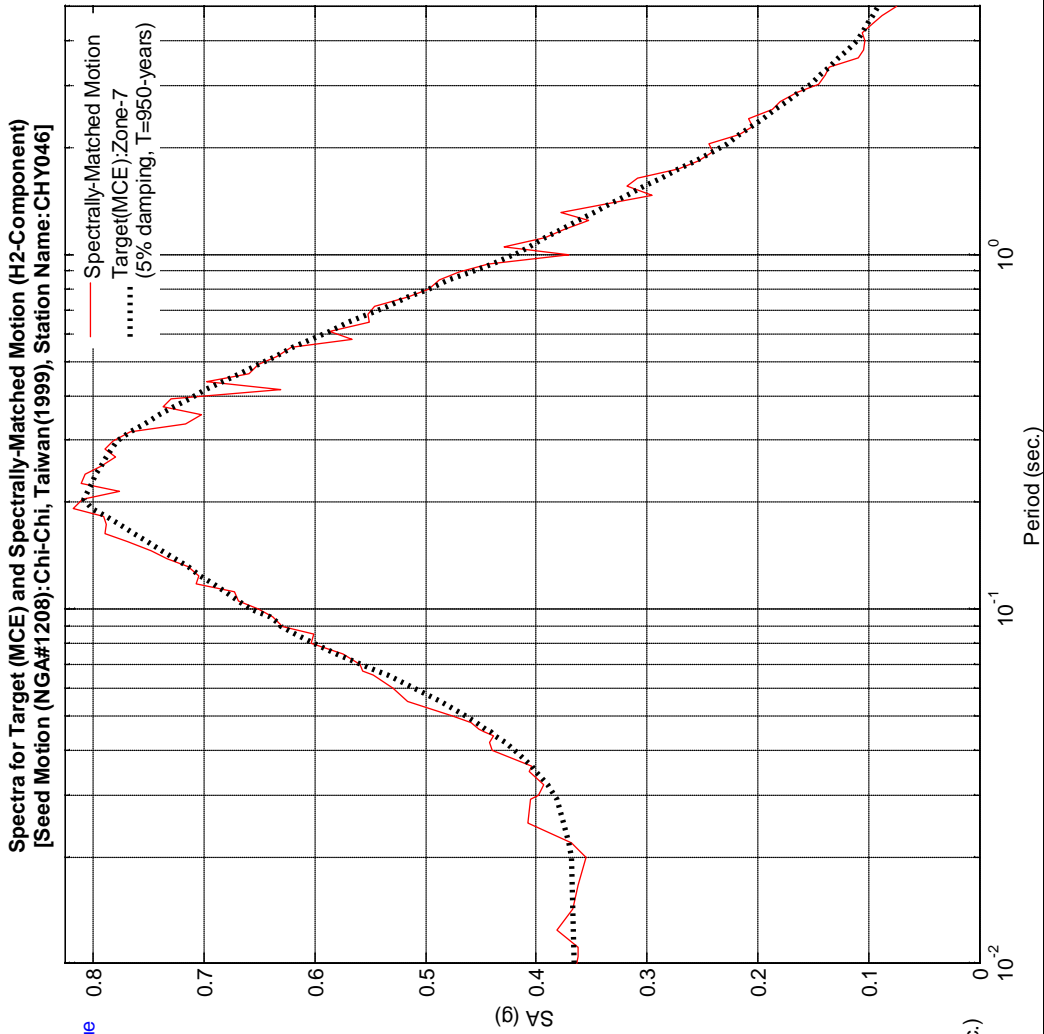
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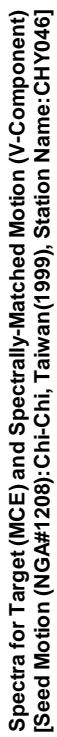
**CALIFORNIA HIGH SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD, CALIFORNIA**

PLATE

A7-16



<div>SC SOLUTIONS</div>		PROJ. NO: BY: QC CHECK: QA CHECK: DATE:		J. Zhong M. Perez V. Jacob 09/07/2012		<div>SPECTRALLY-MATCHED MOTIONS – MCE ZONE 7 – SET NO. 6 – HORIZONTAL 2</div> <div>CALIFORNIA HIGH SPEED TRAIN PROJECT FRESNO TO BAKERSFIELD, CALIFORNIA</div>		PLATE <div>A7-17</div>
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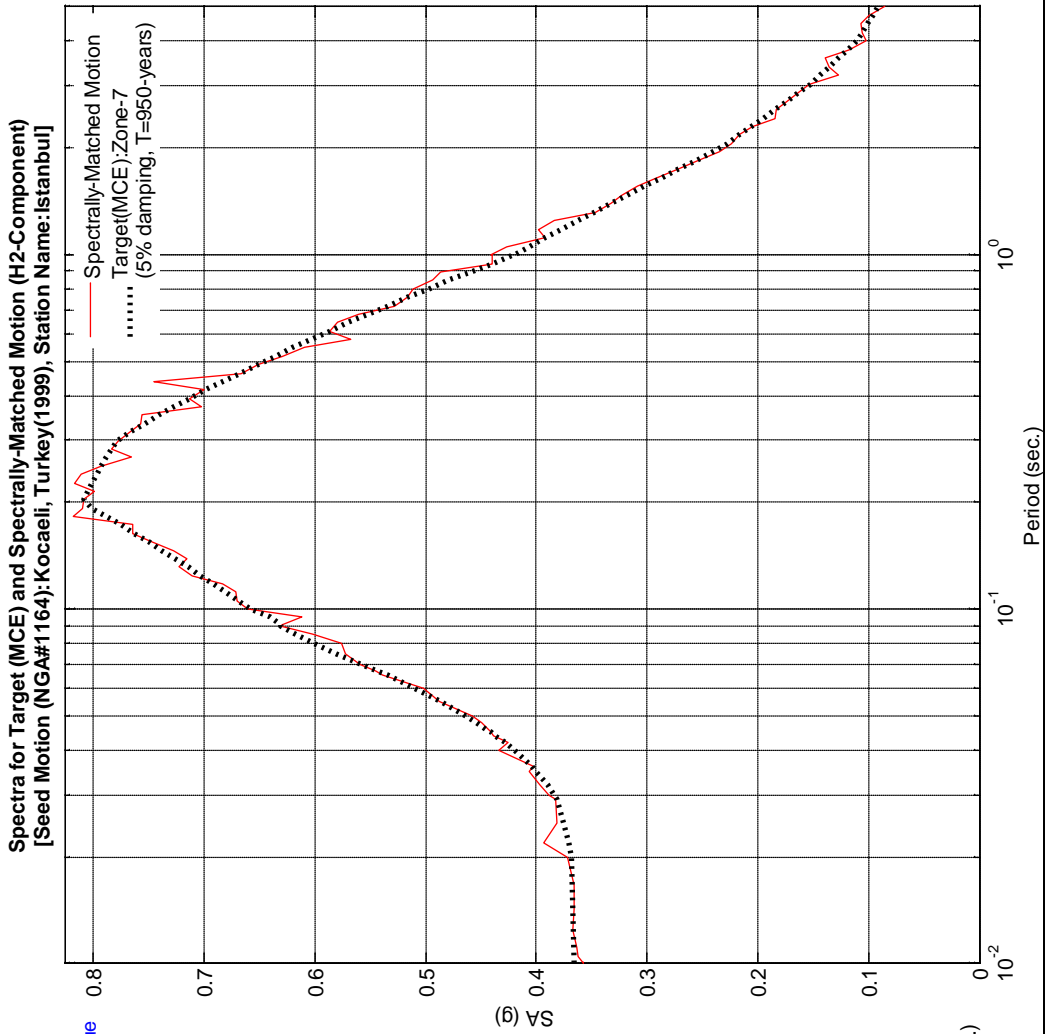


**SPECTRALLY-MATCHED
MOTIONS – MCE
ZONE 7 – SET NO. 6 – VERTICAL**

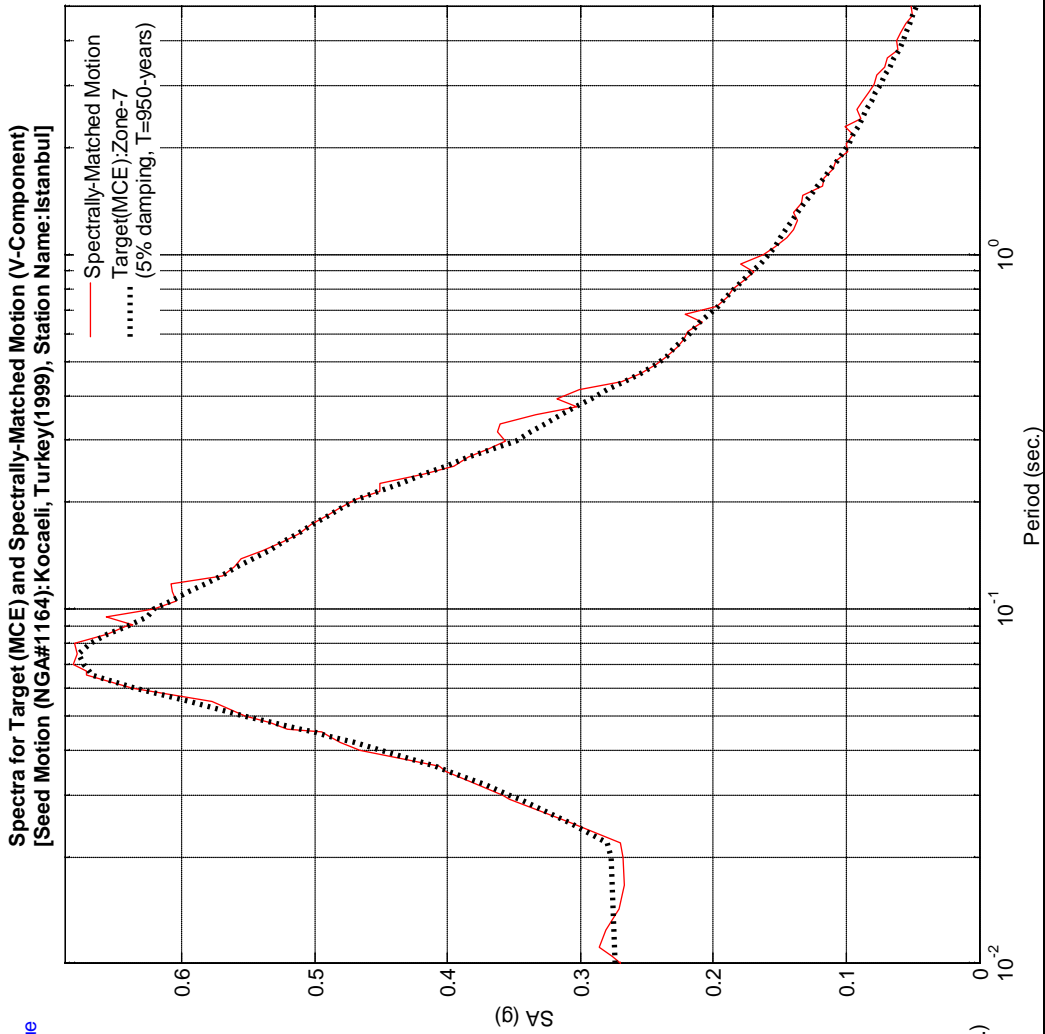
SC SOLUTIONS

A7-18





HSR 13-06 - EXECUTION VERSION



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Table B.1: Ground Motion Metrics for Selected Seed and Spectrally-Matched Motions for Zone 1

Set	NGA #	Selected Seed Motions				Spectrally-Matched Motions							
		Earthquake Name	Year	Station Name	Mw	R	PGA H1 (g)	PGV H1 (cm/s)	PGD H1 (cm)	PGA H2 (g)	PGV H2 (cm/s)	PGD H2 (cm)	PGD V (cm)
1	832	Landers	1992	Amboy	7.28	69.21	0.075	9.773	7.861	0.076	9.305	3.511	2.233
2	1637	Manjil, Iran	1990	Rudsar	7.37	64.47	0.076	6.509	2.012	0.073	8.878	2.220	2.212
3	907	Big Bear-01	1992	Hesperia - 4th & Palm	6.46	44.80	0.074	6.307	2.290	0.076	10.661	2.916	1.442
4	2112	Denali, Alaska	2002	TAPS Pump Station #08	7.90	104.94	0.076	10.745	5.125	0.075	8.693	6.185	3.690
5	882	Landers	1992	North Palm Springs	7.28	26.84	0.075	7.222	3.311	0.075	6.545	3.185	2.238
6	1776	Hector Mine	1999	Desert Hot Springs	7.13	56.40	0.076	6.938	4.959	0.075	7.311	4.007	1.619
7	2938	Chi-Chi, Taiwan-05	1999	CHY016	6.20	110.34	0.077	9.321	4.121	0.077	6.814	2.934	1.633

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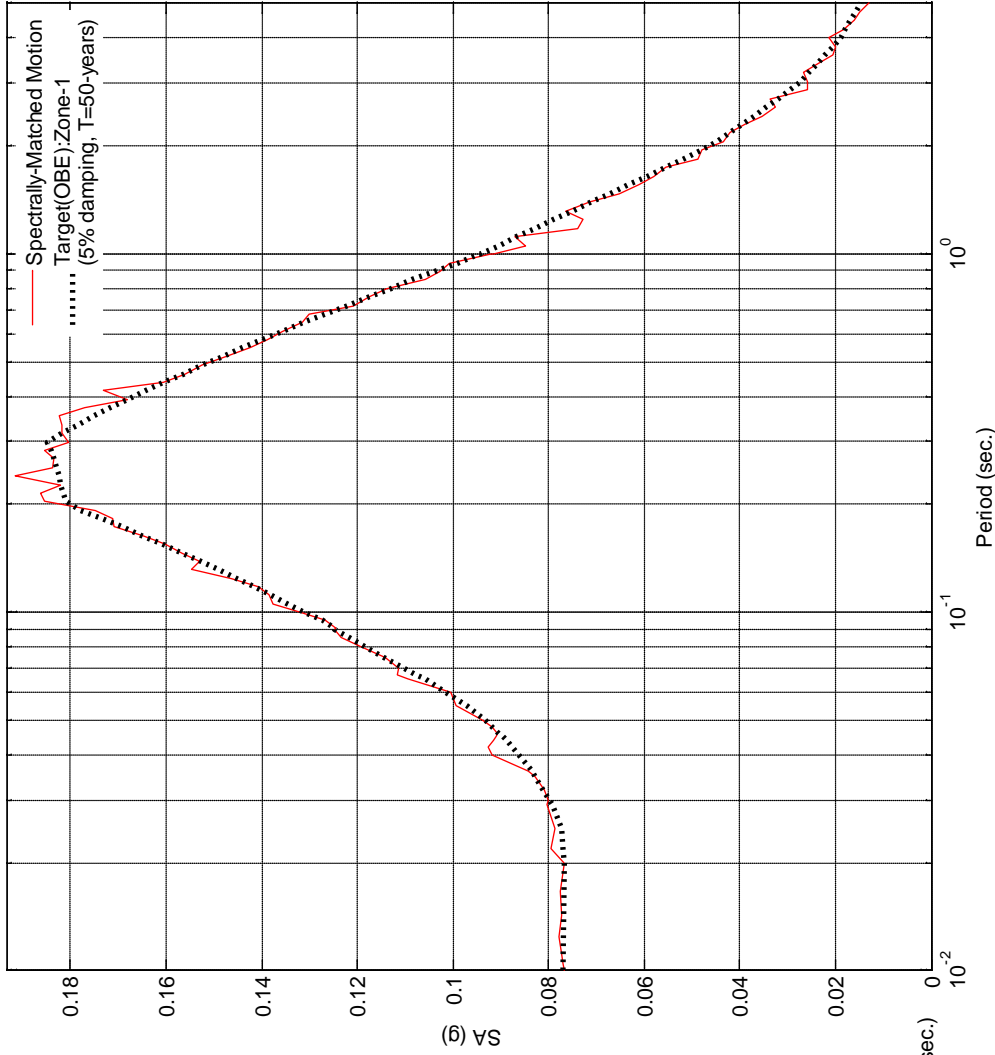
**SELECTED SEED AND
SPECTRALLY-MATCHED MOTIONS**
OBE – ZONE 1

CALIFORNIA HIGH SPEED TRAIN PROJECT
MERCED TO FRESNO, CALIFORNIA

PLATE

B1-0



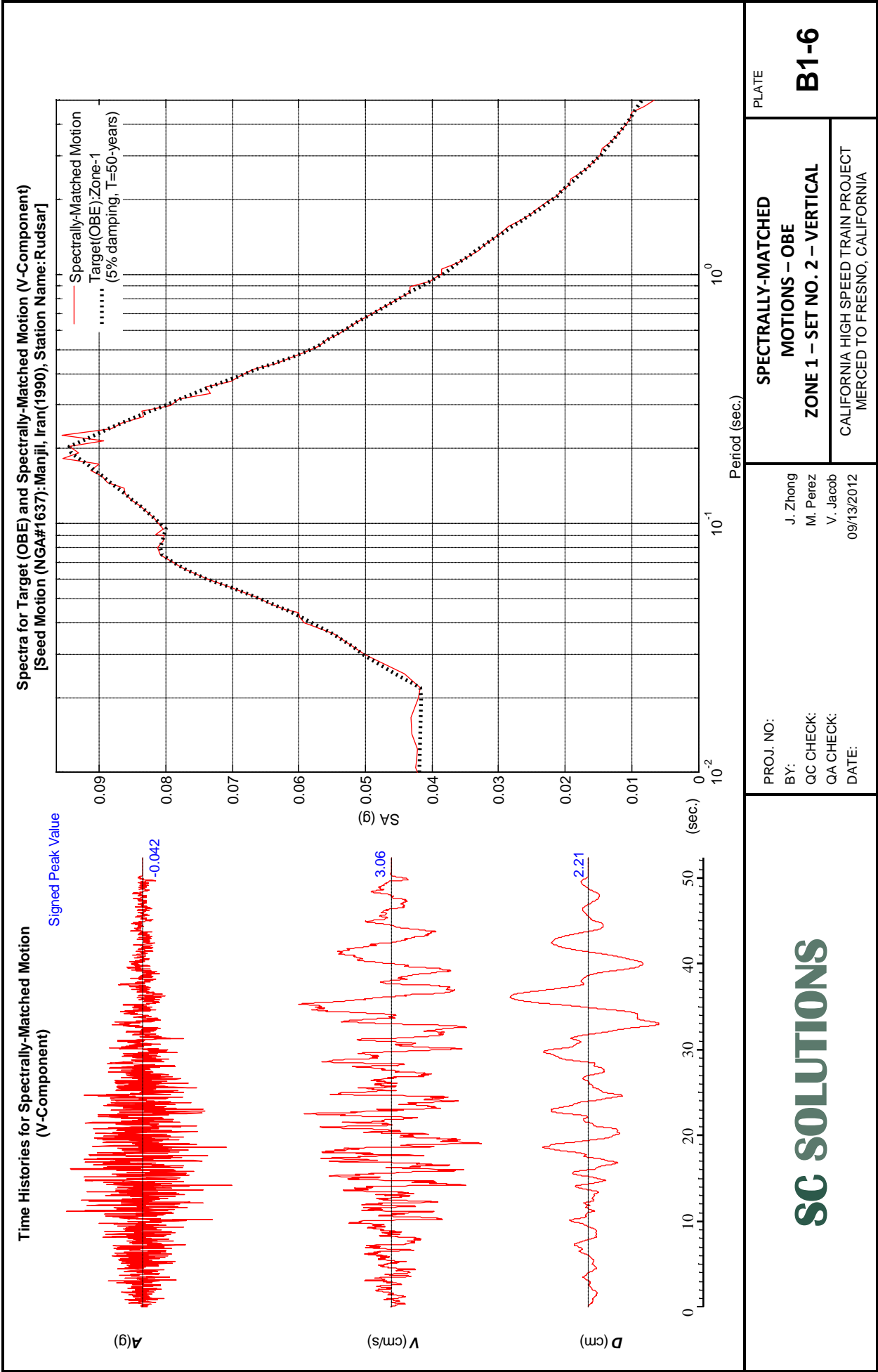


ZONE 1 – SET NO. 1 – HORIZONTAL 2
CALIFORNIA HIGH SPEED TRAIN PROJECT
MERCED TO FRESNO, CALIFORNIA







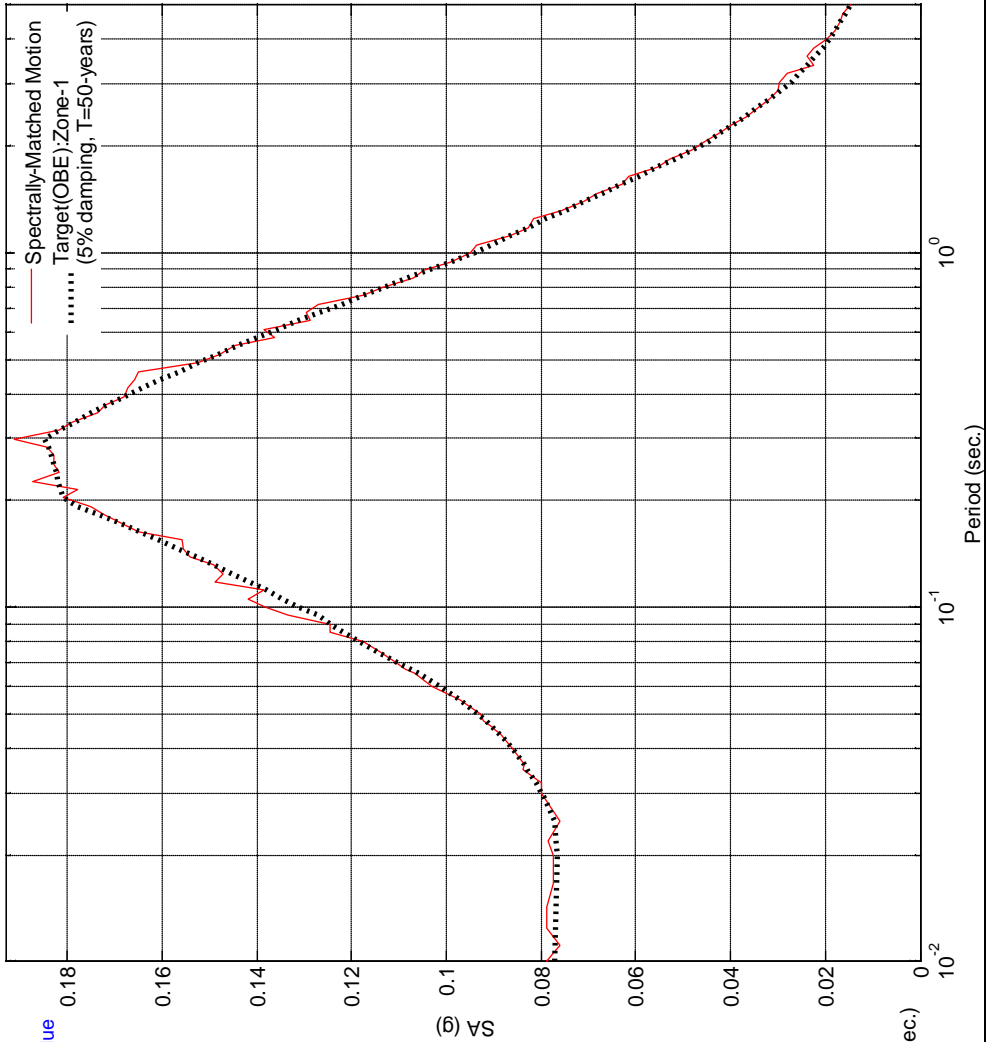












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MOTIONS – UBE
ZONE 1 – SET NO. 4 – HORIZONTAL 2

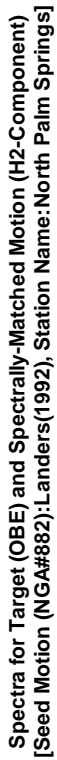
CALIFORNIA HIGH SPEED TRAIN PROJECT
MERCED TO FRESNO, CALIFORNIA

PLATE

B1-11







CALIFORNIA HIGH SPEED TRAIN PROJECT
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CALIFORNIA HIGH SPEED TRAIN PROJECT
MERCED TO FRESNO, CALIFORNIA

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Table B.2: Ground Motion Metrics for Selected Seed and Spectrally-Matched Motions for Zone 2

Set	NGA #	Selected Seed Motions				Spectrally-Matched Motions							
		Earthquake Name	Year	Station Name	Mw	R	PGA H1 (g)	PGV H1 (cm/s)	PGD H1 (cm)	PGA H2 (g)	PGV H2 (cm/s)	PGD H2 (cm)	PGD V (cm)
1	832	Landers	1992	Amboy	7.28	69.21	0.065	7.525	6.537	0.065	7.131	2.924	1.887
2	1637	Manjil, Iran	1990	Rudsar	7.37	64.47	0.066	5.254	1.686	0.063	6.822	1.971	1.657
3	907	Big Bear-01	1992	Hesperia - 4th & Palm	6.46	44.80	0.065	4.932	1.924	0.066	8.182	2.050	1.251
4	2112	Denali, Alaska	2002	TAPS Pump Station #08	7.90	104.94	0.067	8.425	4.324	0.064	7.238	5.110	3.054
5	882	Landers	1992	North Palm Springs	7.28	26.84	0.065	5.347	2.445	0.065	5.196	2.500	1.344
6	1776	Hector Mine	1999	Desert Hot Springs	7.13	56.40	0.064	5.538	3.806	0.065	5.265	2.764	1.412
7	2938	Chi-Chi, Taiwan-05	1999	CHY016	6.20	110.34	0.065	7.353	3.139	0.065	5.227	2.374	1.452

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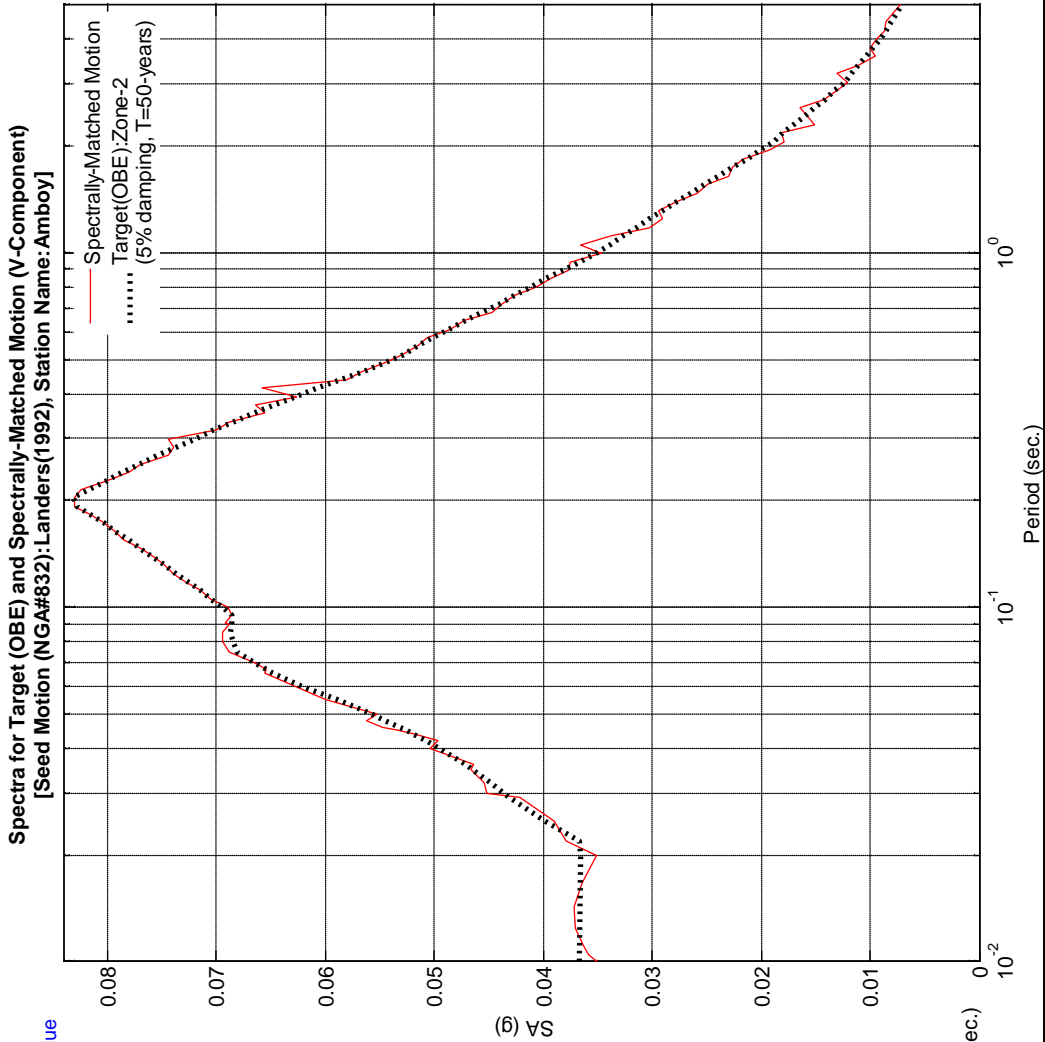
**SELECTED SEED AND
SPECTRALLY-MATCHED MOTIONS**
OBE – ZONE 2
CALIFORNIA HIGH SPEED TRAIN PROJECT
MERCED TO FRESNO, CALIFORNIA

PLATE

B2-0







<div>SC SOLUTIONS</div>	PROJ. NO: BY: QC CHECK: QA CHECK: DATE:	J. Zhong M. Perez V. Jacob 09/13/2012	SPECTRALLY-MATCHED MOTIONS – OBE ZONE 2 – SET NO. 1 – VERTICAL		PLATE B2-3
			CALIFORNIA HIGH SPEED TRAIN PROJECT MERCED TO FRESNO, CALIFORNIA		











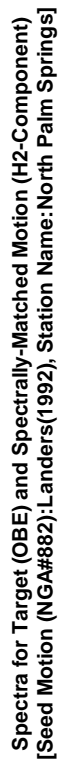












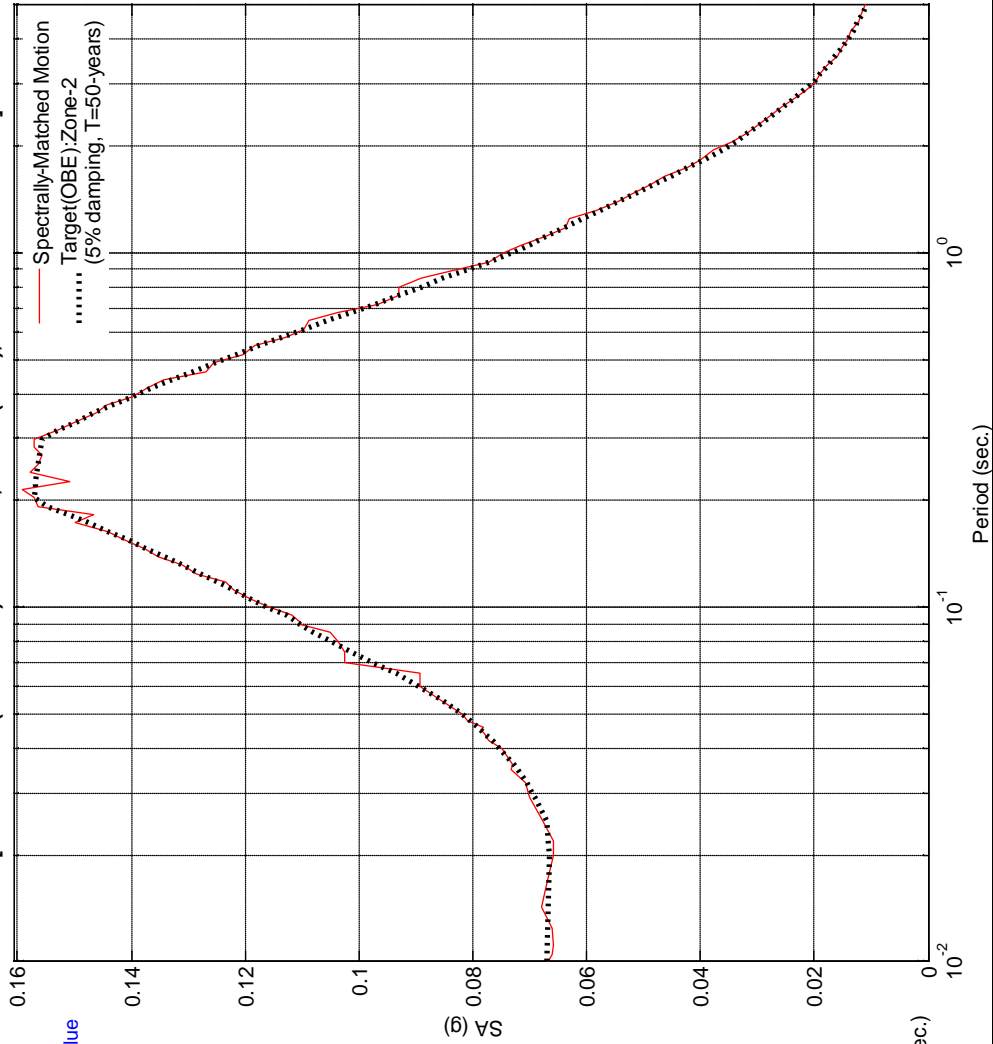
CALIFORNIA HIGH SPEED TRAIN PROJECT
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Table B.3: Ground Motion Metrics for Selected Seed and Spectrally-Matched Motions for Zone 3

Set	NGA #	Selected Seed Motions				Spectrally-Matched Motions							
		Earthquake Name	Year	Station Name	Mw	R	PGA H1 (g)	PGV H1 (cm/s)	PGD H1 (cm)	PGA H2 (g)	PGV H2 (cm/s)	PGD H2 (cm)	PGD V (cm)
1	832	Landers	1992	Amboy	7.28	69.21	0.058	6.085	5.404	0.058	5.994	2.535	1.756
2	1637	Manjil, Iran	1990	Rudsar	7.37	64.47	0.058	4.186	1.265	0.056	5.420	1.495	1.514
3	907	Big Bear-01	1992	Hesperia - 4th & Palm	6.46	44.80	0.057	4.060	1.653	0.059	6.908	1.615	1.122
4	2112	Denali, Alaska	2002	TAPS Pump Station #08	7.90	104.94	0.058	6.866	3.544	0.056	6.021	4.350	2.812
5	882	Landers	1992	North Palm Springs	7.28	26.84	0.058	4.625	1.685	0.058	4.208	2.056	1.713
6	1776	Hector Mine	1999	Desert Hot Springs	7.13	56.40	0.056	4.597	3.337	0.058	4.334	2.381	1.494
7	2938	Chi-Chi, Taiwan-05	1999	CHY016	6.20	110.34	0.058	5.935	2.422	0.055	4.036	1.963	1.344

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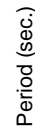
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**SELECTED SEED AND
SPECTRALLY-MATCHED MOTIONS**
OBE – ZONE 3

CALIFORNIA HIGH SPEED TRAIN PROJECT
MERCED TO FRESNO, CALIFORNIA

PLATE

B3-0



PLATE

SC SOLUTIONS

B3-1

ZONE 3 – SET NO. 1 – HORIZONTAL 1

CALIFORNIA HIGH SPEED TRAIN PROJECT
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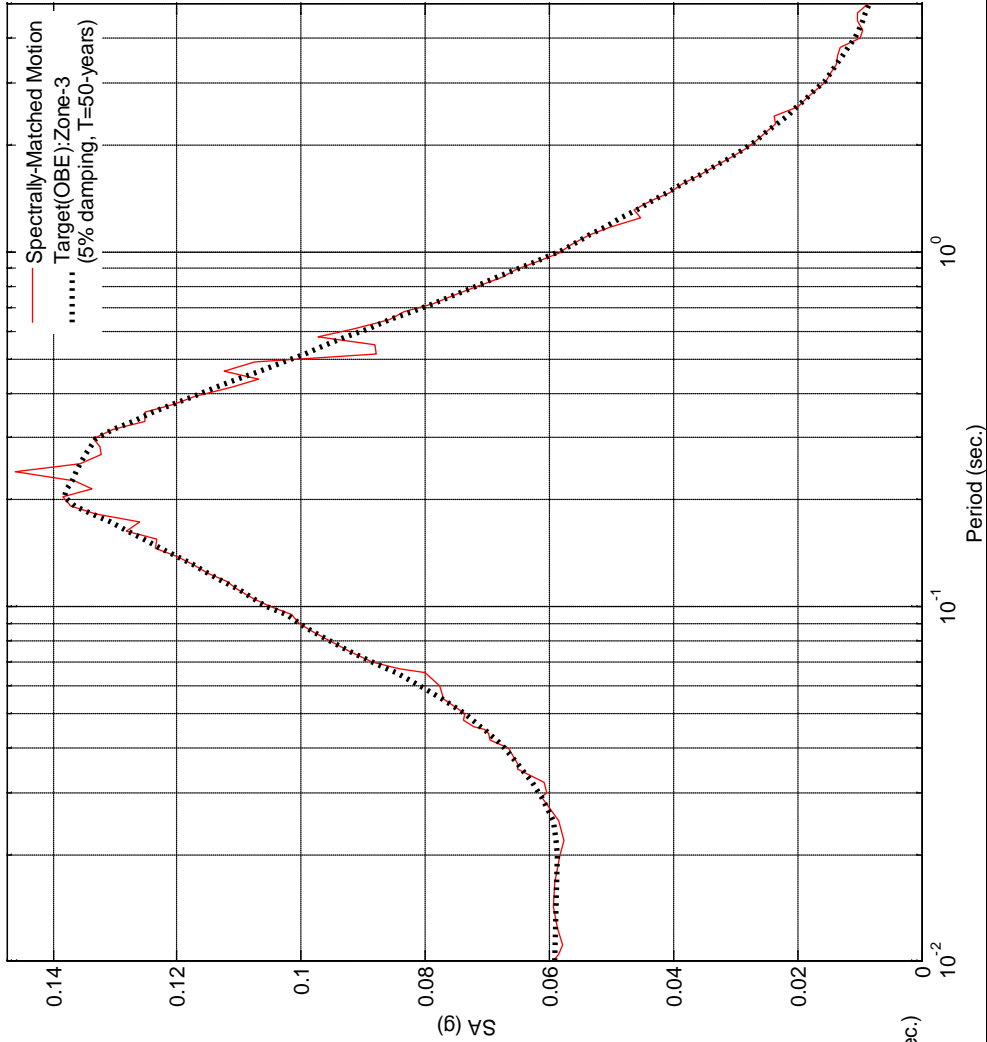
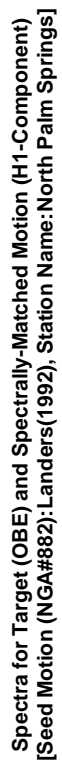












CALIFORNIA HIGH SPEED TRAIN PROJECT
MERCED TO FRESNO, CALIFORNIA

B3-13















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Table B.4: Ground Motion Metrics for Selected Seed and Spectrally-Matched Motions for Zone 4

Set	NGA #	Selected Seed Motions				Spectrally-Matched Motions							
		Earthquake Name	Year	Station Name	Mw	R	PGA H1 (g)	PGV H1 (cm/s)	PGD H1 (cm)	PGA H2 (g)	PGV H2 (cm/s)	PGD H2 (cm)	PGD V (cm)
1	832	Landers	1992	Amboy	7.28	69.21	0.074	8.563	7.440	0.074	8.570	3.467	1.939
2	1637	Manjil, Iran	1990	Rudsar	7.37	64.47	0.074	6.371	1.981	0.073	7.892	2.277	1.721
3	907	Big Bear-01	1992	Hesperia - 4th & Palm	6.46	44.80	0.074	5.626	2.194	0.075	9.371	2.348	1.260
4	2112	Denali, Alaska	2002	TAPS Pump Station #08	7.90	104.94	0.077	9.676	4.967	0.074	8.346	5.892	3.437
5	882	Landers	1992	North Palm Springs	7.28	26.84	0.075	6.163	2.818	0.075	5.968	2.871	2.090
6	1776	Hector Mine	1999	Desert Hot Springs	7.13	56.40	0.074	6.380	4.385	0.075	6.028	3.164	1.564
7	2938	Chi-Chi, Taiwan-05	1999	CHY016	6.20	110.34	0.075	8.422	3.595	0.075	5.999	2.724	1.552

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V. Jacob
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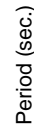
**SELECTED SEED AND
SPECTRALLY-MATCHED MOTIONS**
OBE – ZONE 4

CALIFORNIA HIGH SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD, CALIFORNIA

PLATE

B4-0





CALIFORNIA HIGH SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD, CALIFORNIA

B4-2











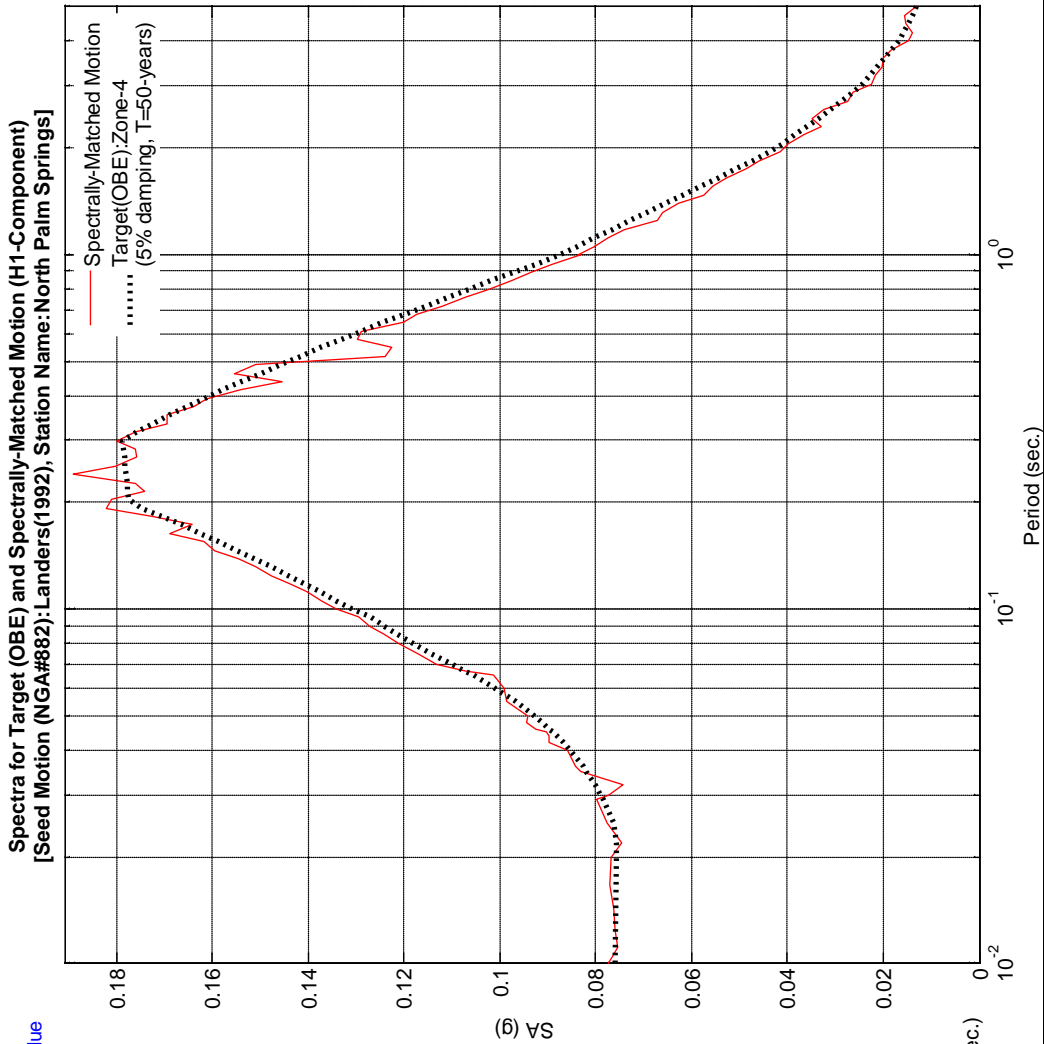












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V. Jacob
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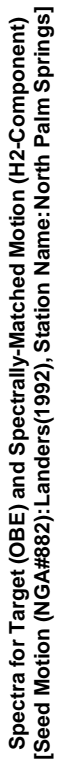
**SPECTRALLY-MATCHED
MOTIONS – OBE**

MOTIONS – UBE
ZONE 4 – SET NO. 5 – HORIZONTAL 1

**CALIFORNIA HIGH SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD, CALIFORNIA**

PLATE

B4-13



CALIFORNIA HIGH SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD, CALIFORNIA

SC SOLUTIONS













HSR 13-06 - EXECUTION VERSION



Table B.5: Ground Motion Metrics for Selected Seed and Spectrally-Matched Motions for Zone 5

Set	NGA #	Selected Seed Motions					Spectrally-Matched Motions								
		Earthquake Name	Year	Station Name	Mw	R	PGA H1 (g)	PGV H1 (cm/s)	PGD H1 (cm)	PGA H2 (g)	PGV H2 (cm/s)	PGD H2 (cm)	PGA V (g)	PGV V (cm/s)	PGD V (cm)
1	832	Landers	1992	Amboy	7.28	69.21	0.083	9.524	8.274	0.083	9.451	3.765	0.048	4.286	2.216
2	1637	Manjil, Iran	1990	Rudsar	7.37	64.47	0.085	6.760	2.169	0.081	8.777	2.536	0.050	3.745	1.830
3	907	Big Bear-01	1992	Hesperia - 4th & Palm	6.46	44.80	0.082	6.257	2.441	0.083	10.423	2.612	0.048	3.242	1.533
4	2112	Denali, Alaska	2002	TAPS Pump Station #08	7.90	104.94	0.085	10.762	5.523	0.083	9.283	6.553	0.044	5.323	4.151
5	882	Landers	1992	North Palm Springs	7.28	26.84	0.084	6.855	3.134	0.084	6.638	3.194	0.049	3.366	2.655
6	1776	Hector Mine	1999	Desert Hot Springs	7.13	56.40	0.082	7.096	4.877	0.083	6.705	3.519	0.048	4.144	1.893
7	2938	Chi-Chi, Taiwan-05	1999	CHY016	6.20	110.34	0.083	9.367	3.999	0.083	6.672	3.030	0.048	4.194	1.759

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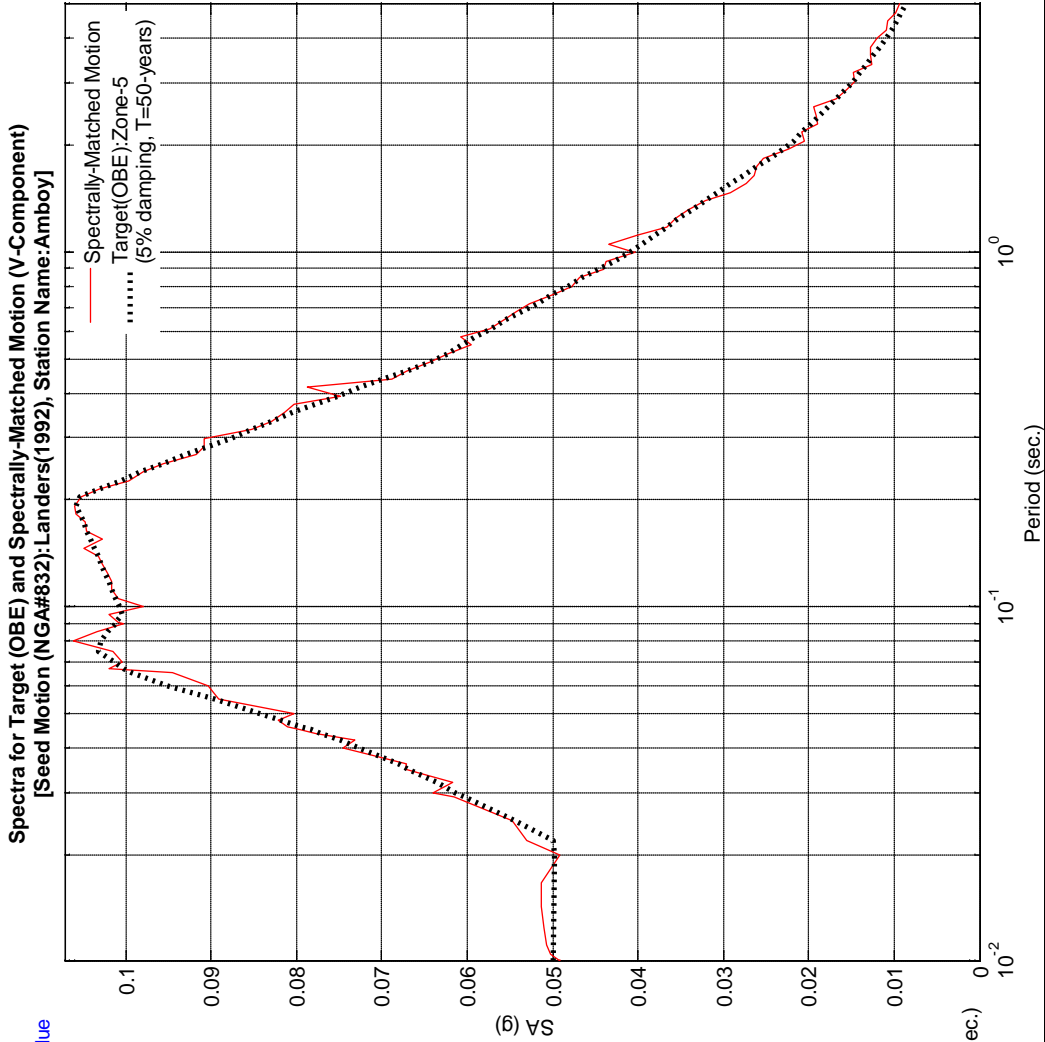
**SELECTED SEED AND
SPECTRALLY-MATCHED MOTIONS**
OBE – ZONE 5
CALIFORNIA HIGH SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD, CALIFORNIA

PLATE

B5-0







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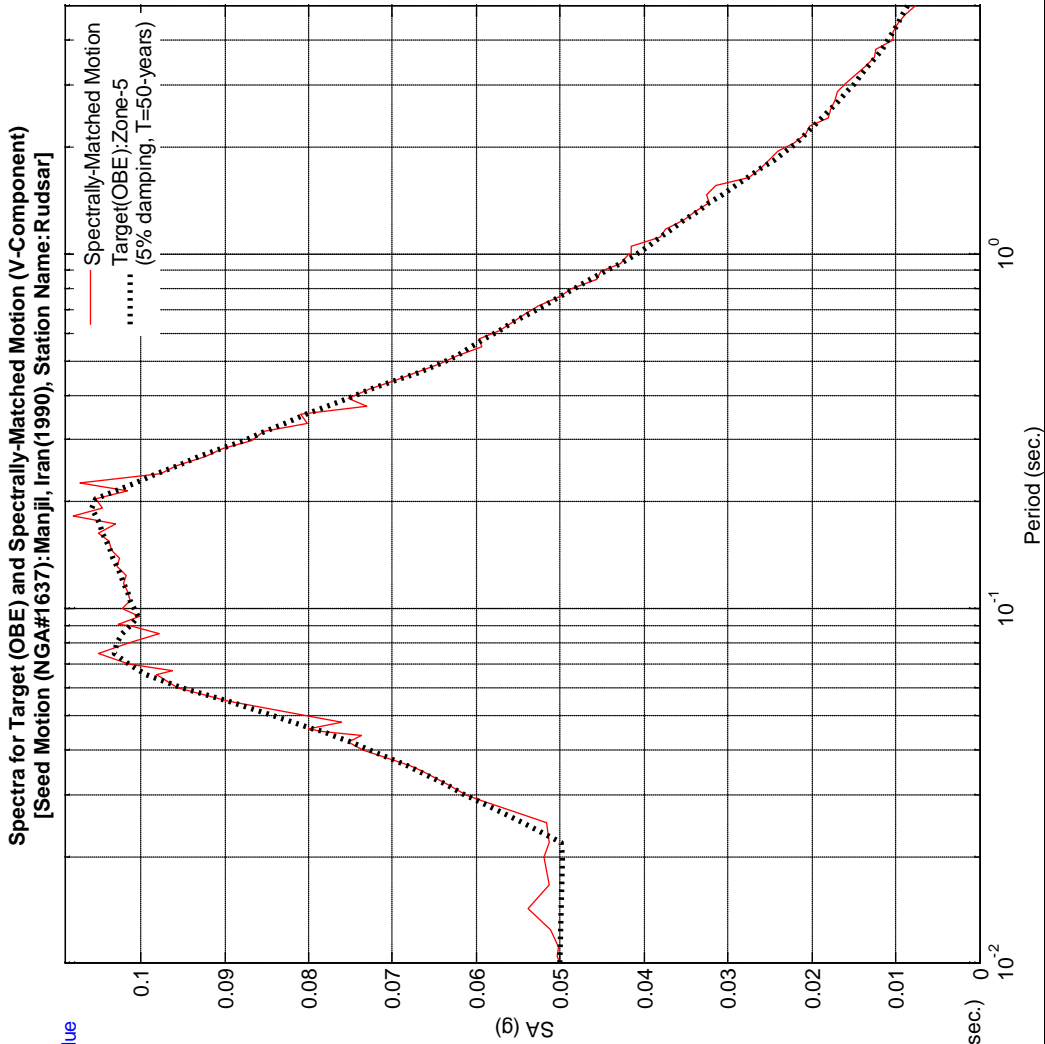
**SPECTRALLY-MATCHED
MOTIONS – OBE
ZONE 5 – SET NO. 1 – VERTICAL**

PLATE

B5-3







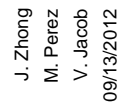
HSR 13-06 - EXECUTION VERSION



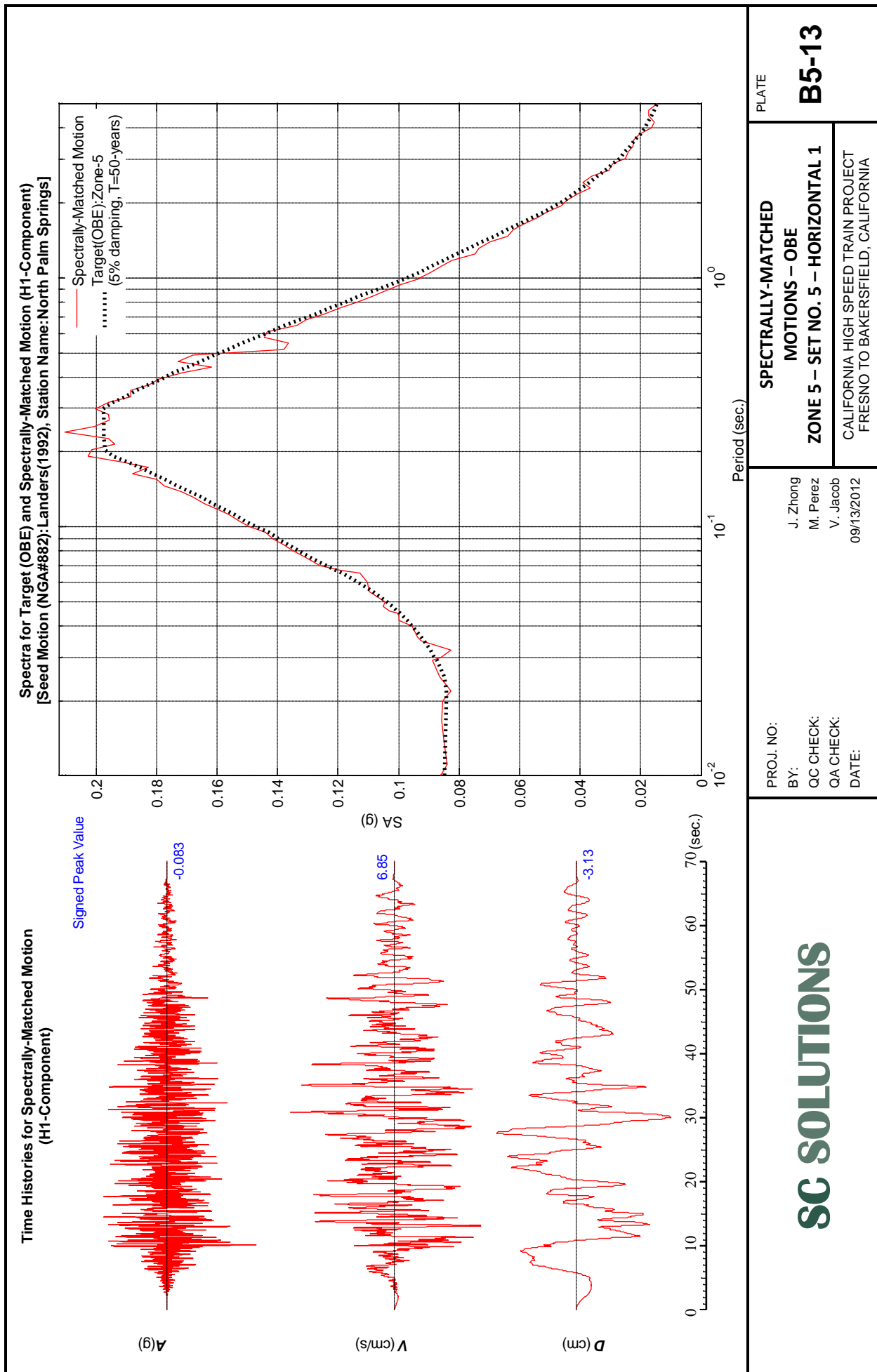




















CALIFORNIA HIGH SPEED TRAIN PROJECT FRESNO TO BAKERSFIELD, CALIFORNIA









Table B.6: Ground Motion Metrics for Selected Seed and Spectrally-Matched Motions for Zone 6

Set	NGA #	Selected Seed Motions				Spectrally-Matched Motions							
		Earthquake Name	Year	Station Name	Mw	R	PGA H1 (g)	PGV H1 (cm/s)	PGD H1 (cm)	PGA H2 (g)	PGV H2 (cm/s)	PGD H2 (cm)	PGD V (cm)
1	832	Landers	1992	Amboy	7.28	69.21	0.095	10.982	9.540	0.096	10.503	4.307	2.537
2	1637	Manjil, Iran	1990	Rudсар	7.37	64.47	0.098	7.795	2.499	0.093	10.120	2.922	2.323
3	907	Big Bear-01	1992	Hesperia - 4th & Palm	6.46	44.80	0.095	7.449	3.720	0.096	12.018	3.011	1.455
4	2112	Denali, Alaska	2002	TAPS Pump Station #08	7.90	104.94	0.098	12.409	6.368	0.095	10.703	7.558	4.508
5	882	Landers	1992	North Palm Springs	7.28	26.84	0.097	7.904	3.615	0.096	7.654	3.682	2.522
6	1776	Hector Mine	1999	Desert Hot Springs	7.13	56.40	0.095	8.183	5.623	0.096	7.731	4.059	1.904
7	2938	Chi-Chi, Taiwan-05	1999	CHY016	6.20	110.34	0.096	10.801	4.611	0.096	7.693	3.493	2.058

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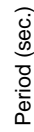
**SELECTED SEED AND
SPECTRALLY-MATCHED MOTIONS**
OBE – ZONE 6

CALIFORNIA HIGH SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD, CALIFORNIA

PLATE

B6-0





PLATE

MOTIONS – OBE
ZONE 6 – SET NO. 1 – HORIZONTAL 2
CALIFORNIA HIGH SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD, CALIFORNIA

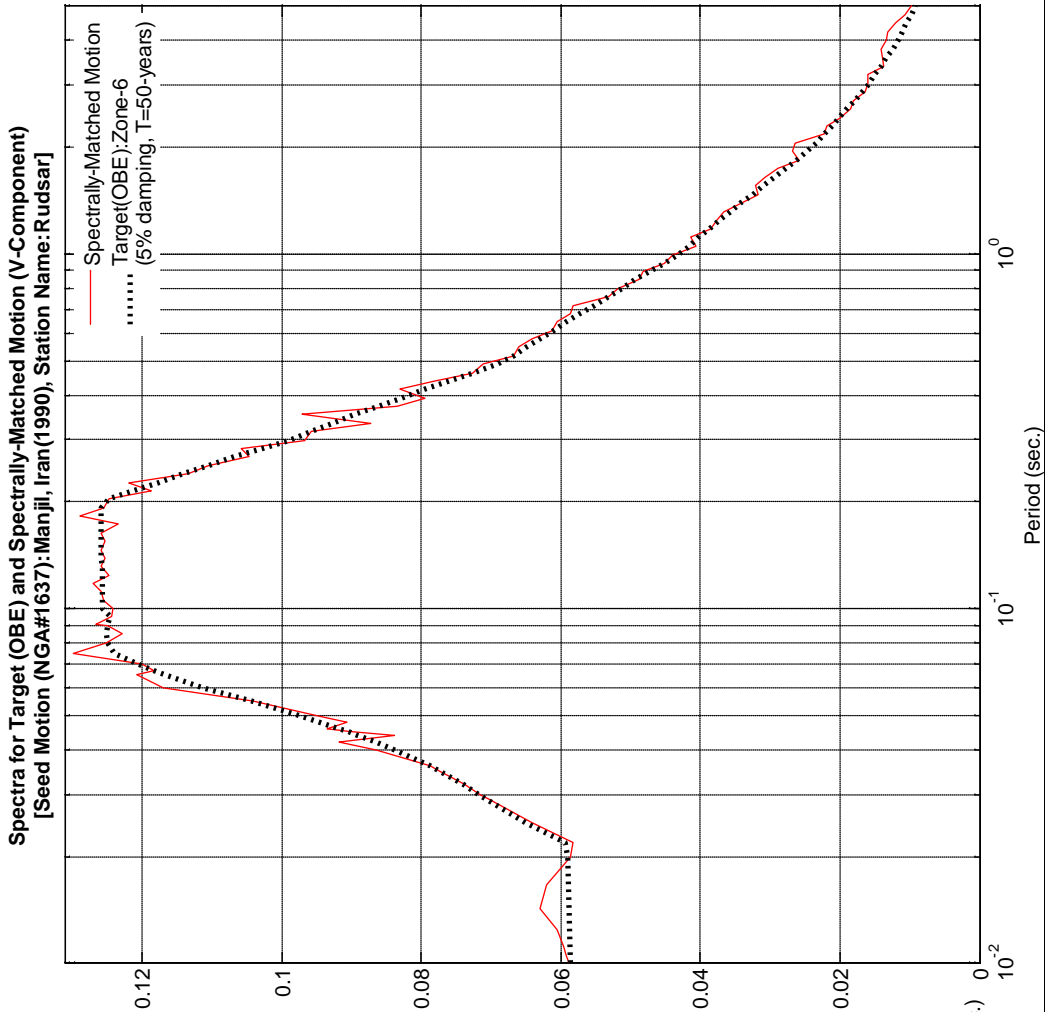
SC SOLUTIONS

B6-2









	PROJ. NO: BY: QC CHECK: QA CHECK: DATE:	J. Zhong M. Perez V. Jacob 09/13/2012	SPECTRALLY-MATCHED MOTIONS – OBE ZONE 6 – SET NO. 2 – VERTICAL	PLATE B6-6
	CALIFORNIA HIGH SPEED TRAIN PROJECT FRESNO TO BAKERSFIELD, CALIFORNIA			

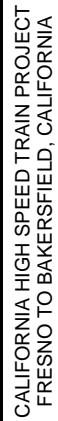


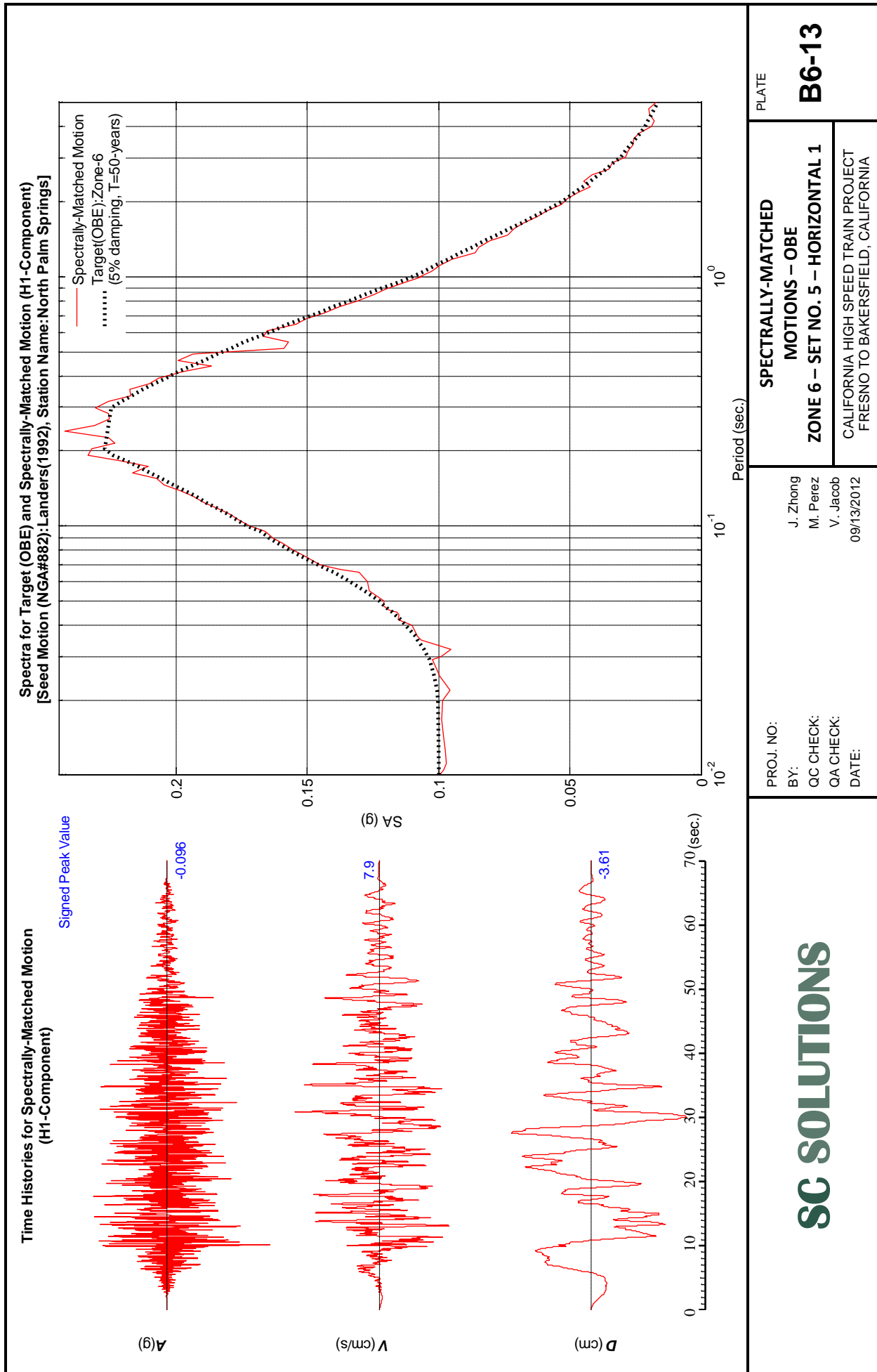














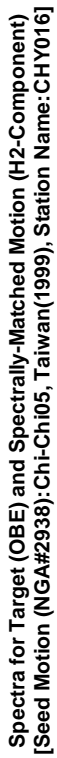












PLATE

**SPECTRALLY-MATCHED
MOTIONS – OBE**

SC SOLUTIONS

ZONE 6 – SET NO. 7 – HORIZONTAL 2

CALIFORNIA HIGH SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD, CALIFORNIA

B6-20



Table B.7: Ground Motion Metrics for Selected Seed and Spectrally-Matched Motions for Zone 7

Set	NGA #	Selected Seed Motions					Spectrally-Matched Motions								
		Earthquake Name	Year	Station Name	Mw	R	PGA H1 (g)	PGV H1 (cm/s)	PGD H1 (cm)	PGA H2 (g)	PGV H2 (cm/s)	PGD H2 (cm)	PGA V (g)	PGV V (cm/s)	PGD V (cm)
1	832	Landers	1992	Amboy	7.28	69.21	0.107	12.333	11.587	0.105	11.440	4.691	0.066	4.890	2.717
2	1637	Manjil, Iran	1990	Rudsar	7.37	64.47	0.106	8.490	2.724	0.102	11.023	3.185	0.069	3.903	2.071
3	907	Big Bear-01	1992	Hesperia - 4th & Palm	6.46	44.80	0.108	7.920	3.640	0.105	13.090	3.280	0.067	3.721	2.306
4	2112	Denali, Alaska	2002	TAPS Pump Station #08	7.90	104.94	0.107	13.516	6.936	0.104	11.658	8.231	0.059	5.883	4.827
5	882	Landers	1992	North Palm Springs	7.28	26.84	0.105	8.608	3.938	0.105	8.336	4.011	0.063	4.724	2.778
6	1776	Hector Mine	1999	Desert Hot Springs	7.13	56.40	0.103	8.912	6.124	0.104	8.421	4.420	0.067	4.270	2.244
7	2938	Chi-Chi, Taiwan-05	1999	CHY016	6.20	110.34	0.104	11.764	5.022	0.104	8.380	3.805	0.067	5.325	2.248

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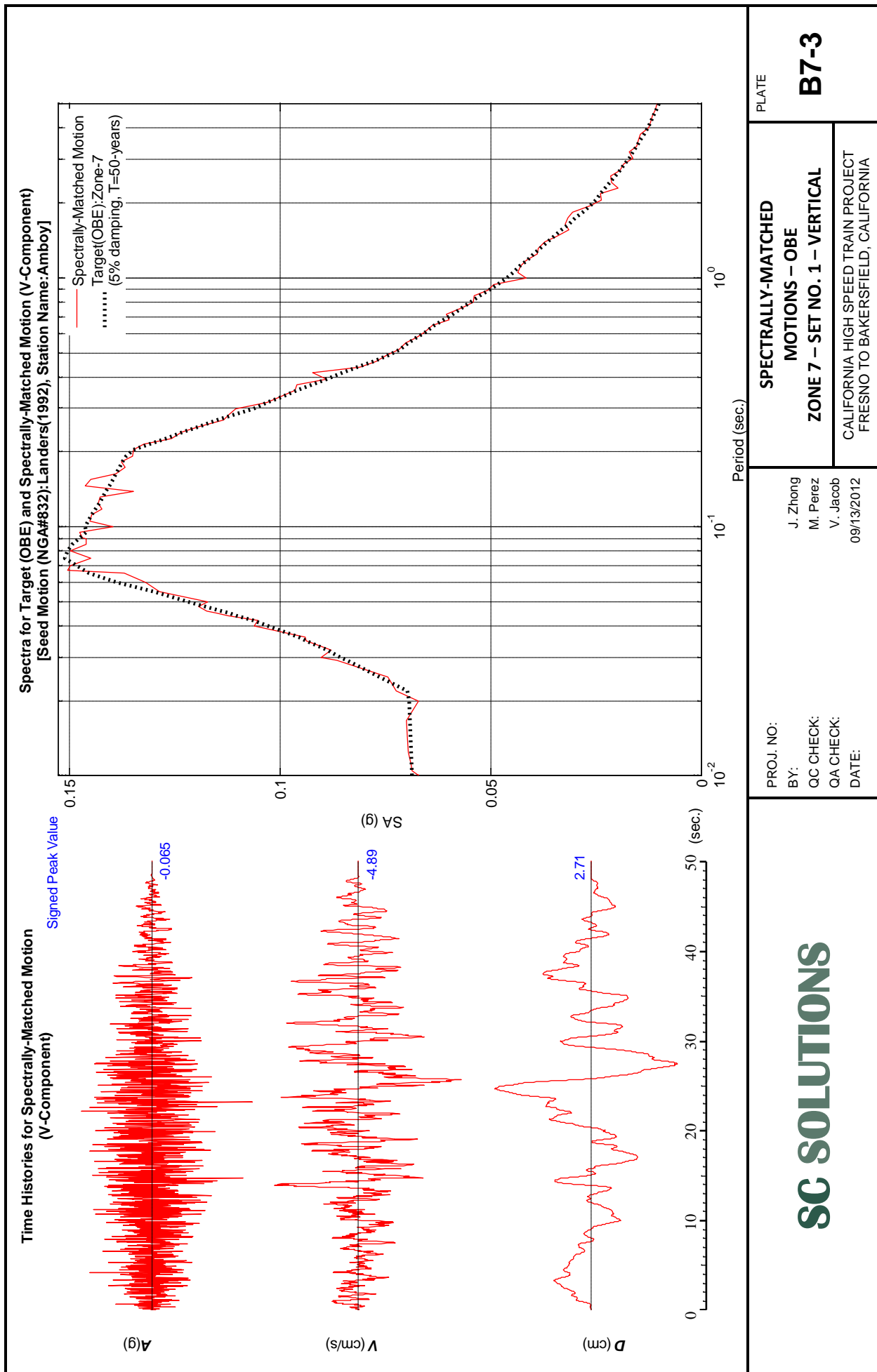
**SELECTED SEED AND
SPECTRALLY-MATCHED MOTIONS**
OBE – ZONE 7
CALIFORNIA HIGH SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD, CALIFORNIA

PLATE

B7-0













CALIFORNIA HIGH SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD, CALIFORNIA













